1998/1999 ANNUAL REPORT

CIPEC

canadian industry program for energy conservation

OEE

Office of Energy Efficiency
Office de l'efficacité énergétique

Leading Canadians to Energy Efficiency at Home, at Work and on the Road

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OUR mission

To promote effective voluntary action that reduces industrial energy use per unit of production, thereby improving economic performance while participating in meeting Canada's climate change objectives.

CIPEC

Canadian Industry Program for
Energy Conservation

1998/1999 CIPEC ANNUAL REPORT

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CHAIRMAN'S letter

The Honourable Ralph Goodale
Minister of Natural Resources
Ottawa, Ontario
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Dear Minister:

In this, our 25th year of voluntary cooperation between government and the private sector, I am pleased to present CIPEC's 1998/1999 Annual Report.

In its quarter-century life, CIPEC has become a shining example of the success that can be achieved through volunteerism. The 1998/1999 year is no exception. Acting on their commitment to the efficient use of energy, hundreds of companies in Canada's mining and manufacturing industries have taken steps to help Canada meet its international climate change commitments. Sector by sector, they have employed their own capital and their own resources to make energy efficiency improvements that benefit all Canadians. They have acted free from the demands of regulation because it makes sound economic sense, and because it is the right thing to do.

I am most encouraged to report that CIPEC's momentum is growing. At the end of the reporting year, CIPEC had expanded to 23 task forces made up of 34 trade and business associations. These associations represent more than 3 000 companies and approximately 90 percent of secondary industrial energy demand in Canada. Among these companies, we see growing individual interest in CIPEC programs, as organizations increasingly look toward our information resources to find new blueprints for action.

Most important, CIPEC participants are delivering results. Through voluntary action, companies under the CIPEC umbrella helped achieve an average annual energy intensity improvement of 1.26 percent for the years 1990 to 1998. Although Canada experienced an extended period of economic growth through the 90s, a trend generally accompanied by increased energy consumption, energy-use-related carbon dioxide emissions increased by a meagre 0.4 percent from 1990 to 1998. This indicates virtual emissions stabilization.

This is my final report to you as Chair of the CIPEC Executive Board. I am pleased that my term is complete at a time when CIPEC's voluntary approach is yielding such exciting results. This success is in no small part due to the continuing support, imagination, dedication and hard work of your staff at the Office of Energy Efficiency. I'd like to express my appreciation for their exceptional contributions and for your commitment to the CIPEC partnership. With your continuing support, the achievements will be the prologue to even better results in the years ahead.

Peter Cooke
Executive Vice-President – Cement, Lafarge Corporation and
Chair, CIPEC Executive Board

25 YEARS OF voluntary success

The year 2000 marks 25 years for the Canadian Industry Program for Energy Conservation (CIPEC). This remarkable milestone is a tribute to the stamina and commitment of hundreds of people in both the public and private sectors across Canada. Their efforts over two and a half decades have enabled CIPEC not only to survive, but also to evolve and grow into the country's principal example of voluntary cooperation between business and government.

CIPEC has shown, and continues to demonstrate, that volunteerism on a major national scale can work. With initiatives coming from nearly every industrial sector in Canada, and with support from government, manufacturing and mining companies are helping Canada to improve its energy efficiency, cut its greenhouse gas (GHG) emissions, and meet its international climate change commitments. In fact, the cooperative philosophy CIPEC represents fits perfectly with Canada's approach as it strives to meet the climate change commitments made at Kyoto, Japan, in 1997.

This report documents the results achieved by mining and manufacturing companies in the 1998/1999 reporting year. It highlights the companies that have backed their commitment to energy efficiency with action, and presents the statistics behind their combined successes.

CIPEC ON THE THRESHOLD

CIPEC is the world's oldest voluntary industrial energy efficiency program and the only industry-wide organization to establish and publish energy-intensity improvement targets. Despite its age, the organization is in a period of strong growth, as manufacturing and mining companies and their trade associations increasingly realize the connection between energy efficiency and operating efficiency. To these organizations, it is clear that what is good for the environment can also be good for business.

Participation in CIPEC is at an all-time high. There are now 23 task forces, each representing an industrial sector (up from 21 in the 1997/1998 report). Within these sectors, 34 trade and business associations are now participating, representing more than 90 percent of the companies in their sectors. At the

HOW CIPEC WORKS

CIPEC is the umbrella organization overseeing an exceptional partnership between government and private industry. CIPEC is composed of sectoral task forces, each of which represents companies engaged in similar industrial activities that participate through their trade associations. Overall direction is provided by an Executive Board made up of private sector leaders committed to industrial energy efficiency. The Task Force Council, with representatives from each CIPEC sector, provides a common forum for sectors to share ideas and recommend ways to address common needs.

CIPEC's extraordinary public-private relationship is successful because it is built not on government regulation, but on trust. In the CIPEC partnership, voluntary change emerges from the dynamics of open and honest communication – a full articulation of issues from all viewpoints that builds consensus and leads to joint action.

CIPEC continues to be the focal point for the manufacturing and mining response to Canada's National Action Program on Climate Change. Our role is to promote the evolution of energy efficiency and to identify and reward those who lead the way.

We carry out this mandate in part through a strong communication and awareness program grounded in our twice-monthly *Heads Up CIPEC* newsletter and regular features in selected trade magazines. *Heads Up CIPEC*, which was first published three years ago with a circulation of 55, now has 1 700 subscribers and boasts a readership of more than 3 000. These programs celebrate energy efficiency innovations and the industry leaders behind them and provide ideas to improve business and economic benefits through reductions in energy use.

CIPEC also raises awareness of the goals and benefits of improved energy use through a number of other efforts. Regular sector task force meetings are held in which non-competitive information is exchanged. The Task Force Council and individual sectors are constantly at work to bring additional participants to the CIPEC fold and to develop communication programs to bolster public and industry awareness of the role and achievements of CIPEC industries.

CIPEC volunteers include successful business leaders and others recognized on the national stage. The quality and profile of these leaders, and their strong belief in voluntary change without government regulation, give CIPEC a strong edge in attracting new industry participants and in continuing the successful partnership between industry and government.

energy conferences sponsored and supported by these sectors, attendance is growing rapidly. ***Increasing numbers of companies are making substantial capital investments and achieving major energy efficiency gains. All indications are that the interest in and commitment to energy efficiency have never been greater.***

AN ENCOURAGING TRACK RECORD

The voluntary efforts of trade associations participating in CIPEC and the companies they represent are having a positive effect on Canada's energy intensity. ***CIPEC's overall annual average improvement in energy intensity from the 1990 base year through 1998 is 1.26 percent, exceeding our target of 1 percent per year. This contrasts with an economic growth rate between 1990 and 1998 of 19.3 percent, an annual average growth rate of 2.3 percent.***

Despite the increased industrial activity brought by strong economic growth, energy-related CO_2 emissions have stabilized. From 1990 through 1998, CO_2 emissions rose by only 0.4 percent in the manufacturing and metal and non-metal mining industries. ***In total, since CIPEC was launched in 1975, the companies within its sectors have reduced their average annual energy intensity by 36 percent.***

These results reflect CIPEC's success in raising awareness of energy efficiency issues and the subsequent willingness of companies to adopt practices and make investments that boost profitability by improving energy use.

AWARD-WINNING PERFORMANCE

A number of companies under the CIPEC umbrella achieved energy efficiency excellence in the 1998/1999 year. Eleven companies are highlighted in the Success Stories section of this report. Five sector companies are among the first recipients of Natural Resources Canada's (NRCan's) Office of Energy Efficiency National Energy Efficiency Awards. Initiated in 1999 as part of NRCan's efforts to encourage companies to improve their energy performance, the annual awards recognize companies in all sectors of the economy that exhibit excellence in their energy efficiency efforts.

Companies that received the awards are:

Potash Corporation of Saskatchewan Inc. – for replacing a cooling tower with a shell and tube exchanger to enable total heat recovery from crystallizer vapours, thereby reducing energy use by 30 percent and saving 134 TJ of energy annually.

Labatt Breweries of Canada – for conducting an energy reduction initiative covering all energy

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Dofasco Inc. and Stelco Inc. – for their major contribution to the development of cost-effective ultralight steel auto body technology, which reduces car frame weight by 35 percent while maintaining structural strength, demonstrating that process and product improvements can be good for both business and the environment.

DML Control Inc. – for engineering a computerized Hench modular refrigeration control system at Maple Lodge Farms Ltd. that saved from 20 percent to 40 percent in annual compressor operating costs.

NRCan received more than 150 submissions for the 1999 National Energy Efficiency Awards, an outstanding response for a new program. Such vigorous and immediate acceptance indicates strong grassroots support for Canada's energy efficiency efforts and accentuates the importance of CIPEC as a resource for companies seeking ways to advance their energy-management programs.

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THE EVOLUTION OF CIPEC DATA

Accurate measurement and meaningful data are fundamental to measuring energy efficiency improvements. The data used in this report is collected by Statistics Canada and interpreted by the Canadian Industrial Energy End-use Data and Analysis Centre (CIEEDAC) at Simon Fraser University in British Columbia. From the Statistics Canada data, CIEEDAC produces energy-intensity indicators for each sector based on production and gross domestic product. CIPEC continues to collaborate with Statistics Canada and CIEEDAC in ongoing efforts to resolve data issues.

The cooperative CIEEDAC system is internationally recognized for its methodologies, data integrity and cooperation with CIPEC. Primary funding for CIEEDAC comes from CIPEC and NRCan with additional contributions from industry associations and the Province of Quebec.

SUCCESS BUILT SECTOR BY SECTOR

CIPEC is effective because it provides a common yet flexible framework for industrial energy efficiency. Sectors, and the associations and organizations of which they are made, work within this framework to take individual and joint actions to meet sectoral energy efficiency goals. Ultimately, it is the willingness of individual enterprises to change their practices and invest in new methods and technologies that determines CIPEC's success.

CIPEC's goal is to encourage companies to take action and to support them with the information and motivation they need to take the steps necessary for improved energy efficiency. Many sectoral task forces have stepped forward to create and implement effective programs focused on targeting, tracking and reporting. Some sectors hold annual energy conferences and many are producing best practice guides, offering education and training, and supporting employee awareness programs. These efforts have helped numerous companies introduce effective energy-management programs and take steps toward greater energy efficiency.

CIPEC CAN DO MORE

CIPEC has survived and grown over 25 years because of a willingness to adapt. Our challenge going forward is to evolve our programs in step with the changing needs of firms as they strive for energy efficiency improvements.

For example, CIPEC's unique government and private sector partnership is identifying new technologies that advance energy efficiency and developing and publicizing innovative financing methods to underwrite energy-based capital investments. Sectors are collaborating to find ways to raise the priority of energy efficiency within Canada's industrial organizations. Sectoral associations are working with CIPEC's government partners to develop meaningful benchmarking tools that can establish performance and measure progress.

All of these efforts, and many more, are needed if Canada is to progress toward its climate change commitments.

GOING FORWARD

While CIPEC sectors and companies have made major advances in energy efficiency, there is much work yet to be done. Existing programs must be enhanced and expanded. New programs must be conceived and launched, and participation must be increased. ***Our goal is to encourage more active companies within the program and more active programs within the companies.***

Our current focus is to establish new targets and a new business plan for the next three years. Existing energy-intensity targets expire in 2000, and CIPEC sectors have been developing and finalizing a new plan to extend to 2003. This plan will provide a focus for action as we progress into the new millennium.

Although CIPEC is 25 years old, there is an unprecedented vitality in the organization. This energy, enthusiasm and underlying strength reflects the importance of our organization to Canada's energy future and the country's ability to meet its international commitments. While there is much to celebrate about CIPEC's past, the indications are that the best is yet to come.

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INNOVATION AND CANADA'S CLIMATE CHANGE VOLUNTARY CHALLENGE AND REGISTRY INC.

The Industrial Energy Innovators initiative helps companies put sector-level commitments into action at the individual corporate level. As of April 1, 2000, 254 companies, representing more than 75 percent of industrial energy use, had signed on as Industrial Energy Innovators. The majority of these companies are participants in Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.).

CIPEC has broadened and deepened individual participation of Industrial Energy Innovators in the VCR Inc. through a number of programs. These include efforts designed to increase awareness of the economic benefits of improved energy use and the development of tools to remove barriers hindering energy-management improvement projects within companies. CIPEC believes that to maximize its impact on energy efficiency, it should lend support to as many parallel efforts as possible.

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CANADIAN INDUSTRY PROGRAM FOR ENERGY CONSERVATION

INNOVATION in action

As the Canadian Industry Program for Energy Conservation (CIPEC) gears up to celebrate its 25th anniversary of volunteer cooperation between the federal government and Canada's manufacturing and mining industries, we invite you to read about the efforts of 11 CIPEC participants that have substantially reduced the energy intensity of their operations.

The approaches and successes exhibited by these forward-looking organizations are only a representative sample of the impressive energy efficiency improvement results being achieved across Canada through the voluntary efforts of Canadian industry. CIPEC participants, such as the companies featured here, demonstrate day in and day out that hundreds of companies taking individual action can have a substantial, positive impact on our environment and make a vital contribution to Canada's success in meeting its international commitments.

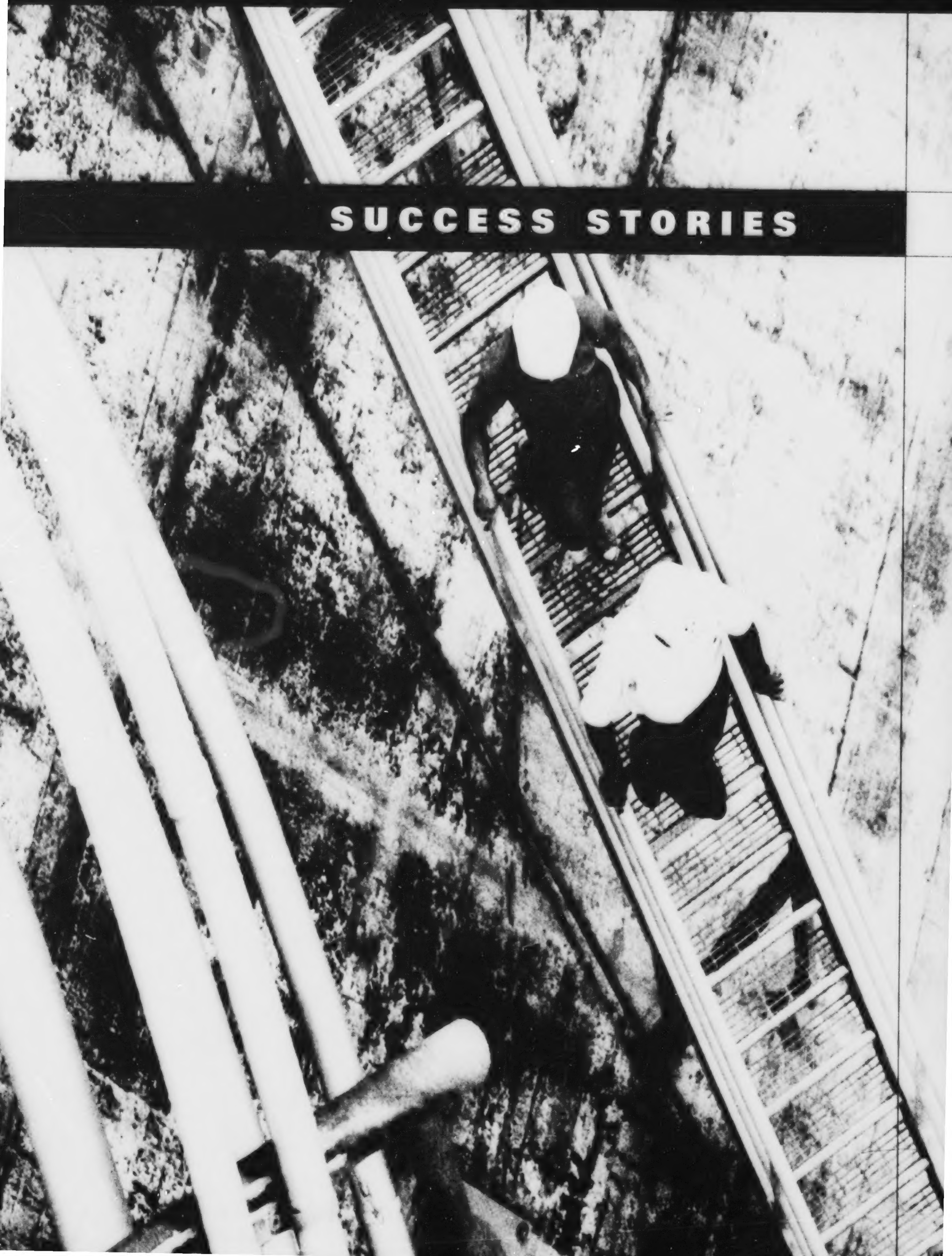
Equally important, investments and efforts designed to improve energy efficiency have also helped participating companies reduce costs and improve profitability – vital components of every successful enterprise's business strategy. Their achievements demonstrate that responsible environmental action can significantly improve the bottom line.

Since 1990, companies participating in CIPEC have made important voluntary contributions toward our nation's goals of decreasing energy intensity and reducing the production of greenhouse gases. Between 1990 and 1997, Canada's mining and manufacturing companies improved their average annual energy intensity by 0.9 percent. Since 1990, despite a strongly expanding economy, better use of energy has enabled these companies to limit related carbon dioxide emissions to a marginal increase of less than 0.5 percent. No other sector of the Canadian economy can lay claim to such results.

Providing a role model for government-business partnerships in Canada, CIPEC continues to be the focal point for the manufacturing and mining response to Canada's National Action Program on Climate Change. CIPEC is also building an international reputation and regularly fields inquiries from governments, business and industry around the world.

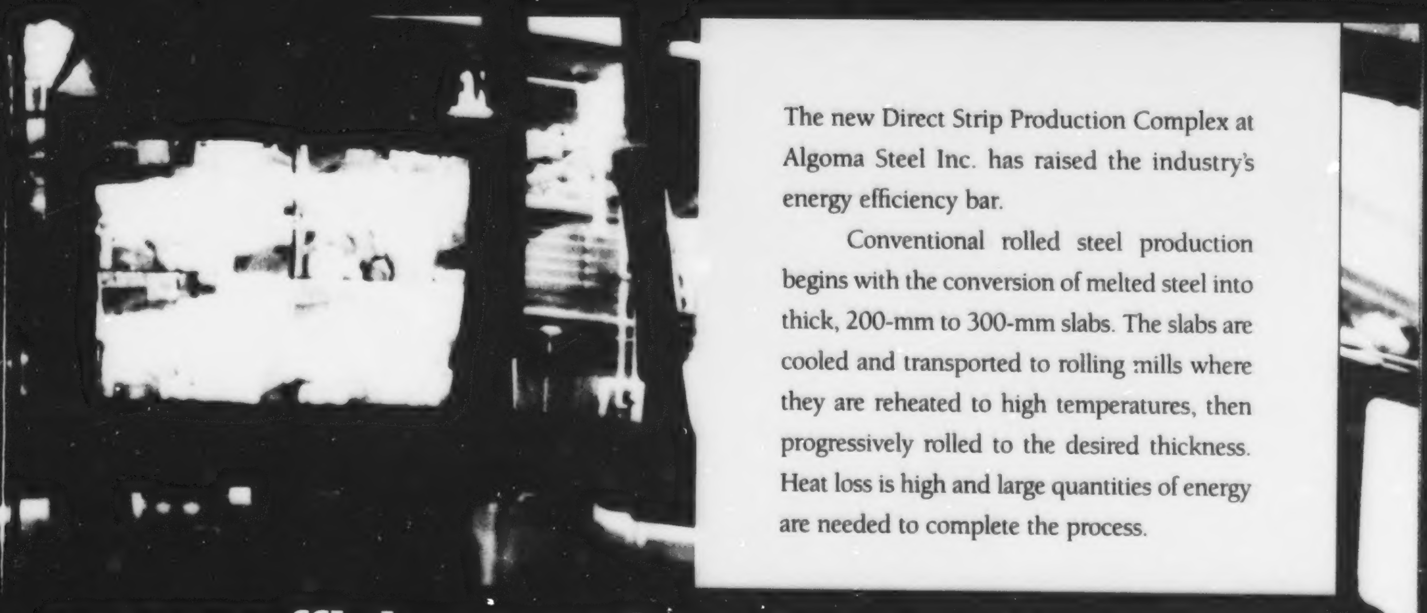
Peter Cooke
Executive Vice-President – Cement, Lafarge Corporation and
Chair, CIPEC Executive Board

SUCCESS STORIES



ALGOMA STEEL INC.

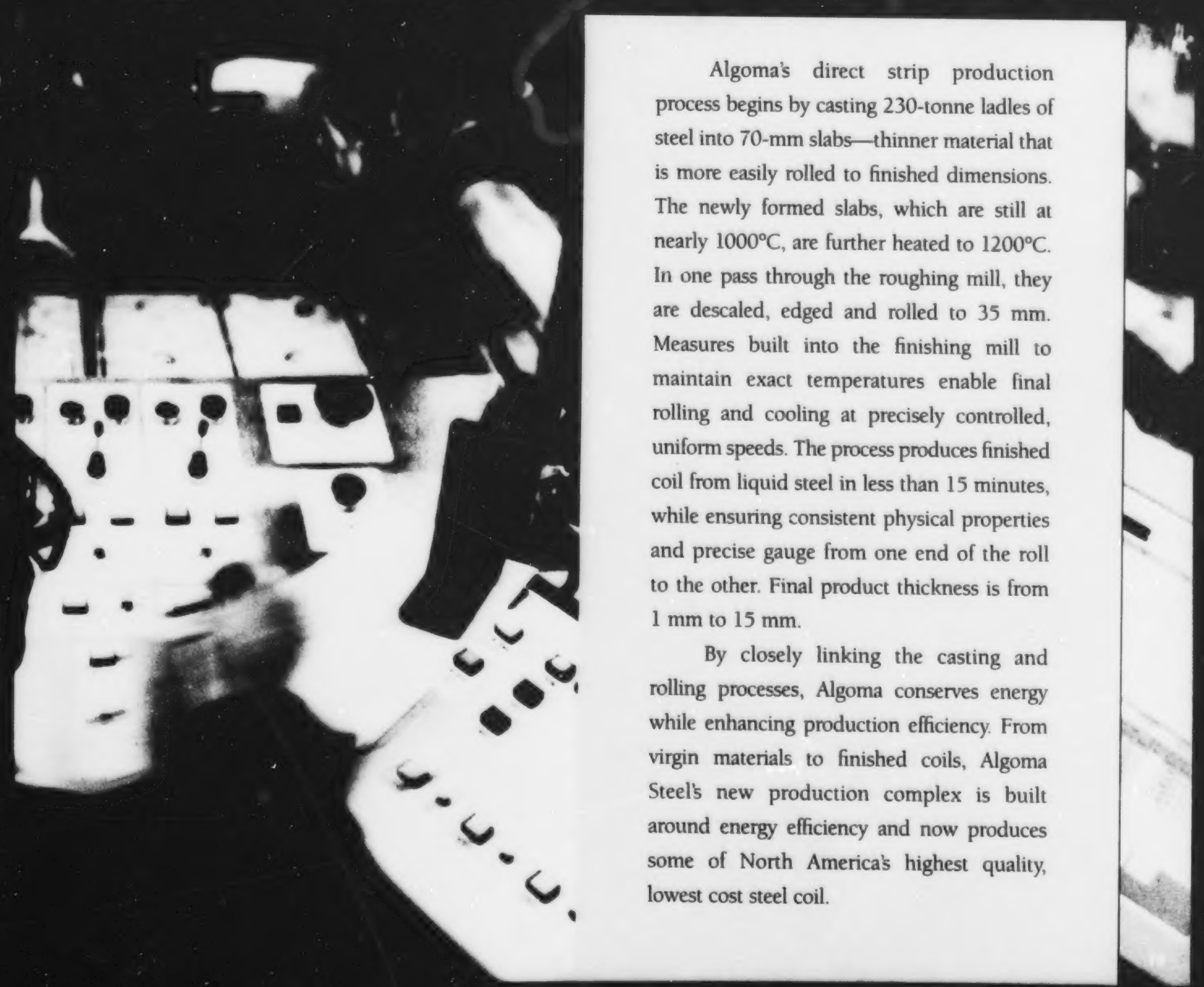
New complex nets major



The new Direct Strip Production Complex at Algoma Steel Inc. has raised the industry's energy efficiency bar.

Conventional rolled steel production begins with the conversion of melted steel into thick, 200-mm to 300-mm slabs. The slabs are cooled and transported to rolling mills where they are reheated to high temperatures, then progressively rolled to the desired thickness. Heat loss is high and large quantities of energy are needed to complete the process.

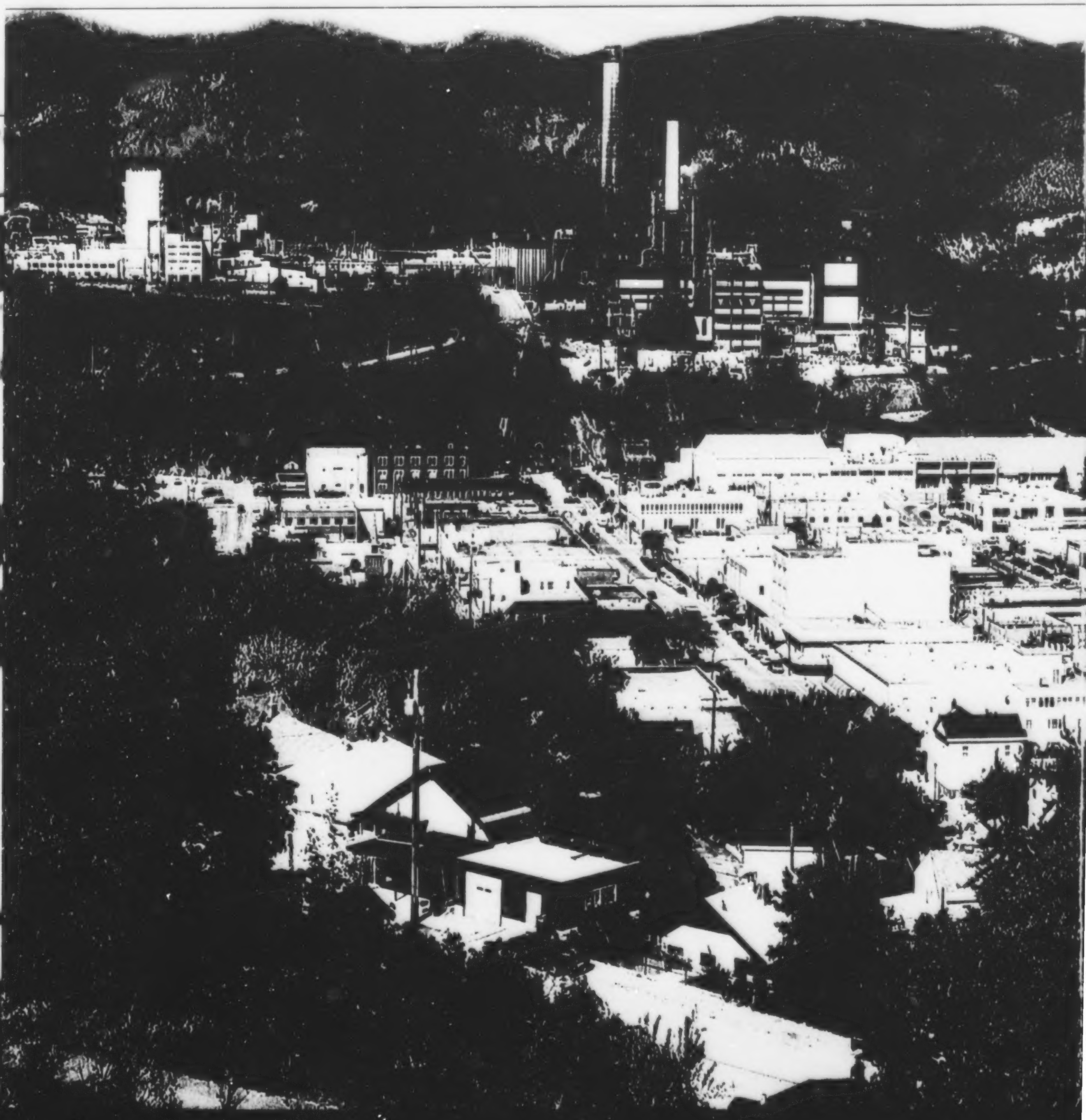
energy efficiency and product quality gains



Algoma's direct strip production process begins by casting 230-tonne ladles of steel into 70-mm slabs—thinner material that is more easily rolled to finished dimensions. The newly formed slabs, which are still at nearly 1000°C, are further heated to 1200°C. In one pass through the roughing mill, they are descaled, edged and rolled to 35 mm. Measures built into the finishing mill to maintain exact temperatures enable final rolling and cooling at precisely controlled, uniform speeds. The process produces finished coil from liquid steel in less than 15 minutes, while ensuring consistent physical properties and precise gauge from one end of the roll to the other. Final product thickness is from 1 mm to 15 mm.

By closely linking the casting and rolling processes, Algoma conserves energy while enhancing production efficiency. From virgin materials to finished coils, Algoma Steel's new production complex is built around energy efficiency and now produces some of North America's highest quality, lowest cost steel coil.

COMINCO LTD. | Massive



An investment of several hundred million dollars over the past two decades has enabled Cominco Ltd. to modernize its mining technology and significantly reduce carbon fuel intensity at its facility in Trail, B.C.

investment brings major emission reductions

State-of-the-art technology, including a recently installed $160-million Kivcet flash smelting process, has enabled Cominco to improve its energy efficiency and cut its greenhouse gas emissions. The new lead smelter has reduced particulate emissions by 95%, metal emissions by 75% to 90% and sulphur dioxide emissions by 75%. Moreover, an ISO 14001-based management system being implemented promises to further improve environmental performance at the Trail facility.

Since its 1989 base year, the facility has achieved a total greenhouse gas reduction of 40%, a 26% drop in carbon energy consumption per tonne of production, and a one-third reduction in carbon dioxide produced per tonne of output. Significantly, these gains were accompanied by reduced operating costs.

In addition, by collecting and marketing the by-products of its pollution abatement efforts, the company has opened a new revenue stream that is making its environmental program even more cost-effective.

Energy efficiency makes I co

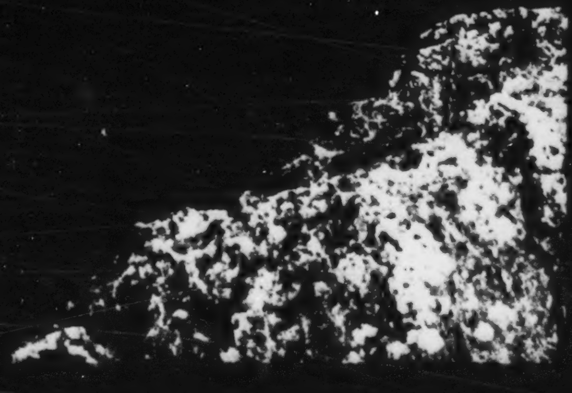
Corner Brook Pulp and Paper Ltd. has demonstrated convincingly that cost reductions and energy efficiency go hand in hand.

a low-cost producer

In 1991, responding to the need to become a low-cost, high-quality producer, the Newfoundland forest products company made thermal energy conservation the top priority in its operations. With the strong commitment of mill management, the company launched an energy efficiency program supported by an awareness campaign to involve all employees in the hunt for energy savings.

The company identified and made easy-to-achieve changes first, then implemented an ongoing program to squeeze all the waste it could from its operations. Monthly energy reports provided the benchmarks to measure progress. The results have been impressive. From 1991 to early 1999, Corner Brook Pulp and Paper saved over $35 million in Bunker "C" oil alone.

Corner Brook Pulp and Paper has transformed itself from one of the industry's highest cost mills to one of the lowest, while at the same time improving the quality of its newsprint. It achieved this metamorphosis by making energy efficiency a major source of cost savings.



| EMCO LIMITED | Plant program is the

A recently launched program at EMCO Ltd.'s plant in LaSalle, Quebec, is demonstrating that energy efficiency also means operating efficiency. The plant, one of three EMCO manufacturing facilities in Canada, produces carton board, roofing shingles and asphalt paper for the construction industry. With an annual company-wide energy bill exceeding $11.5 million, EMCO knows that eliminating wasted energy will play a significant role in reducing its overall cost of operations.

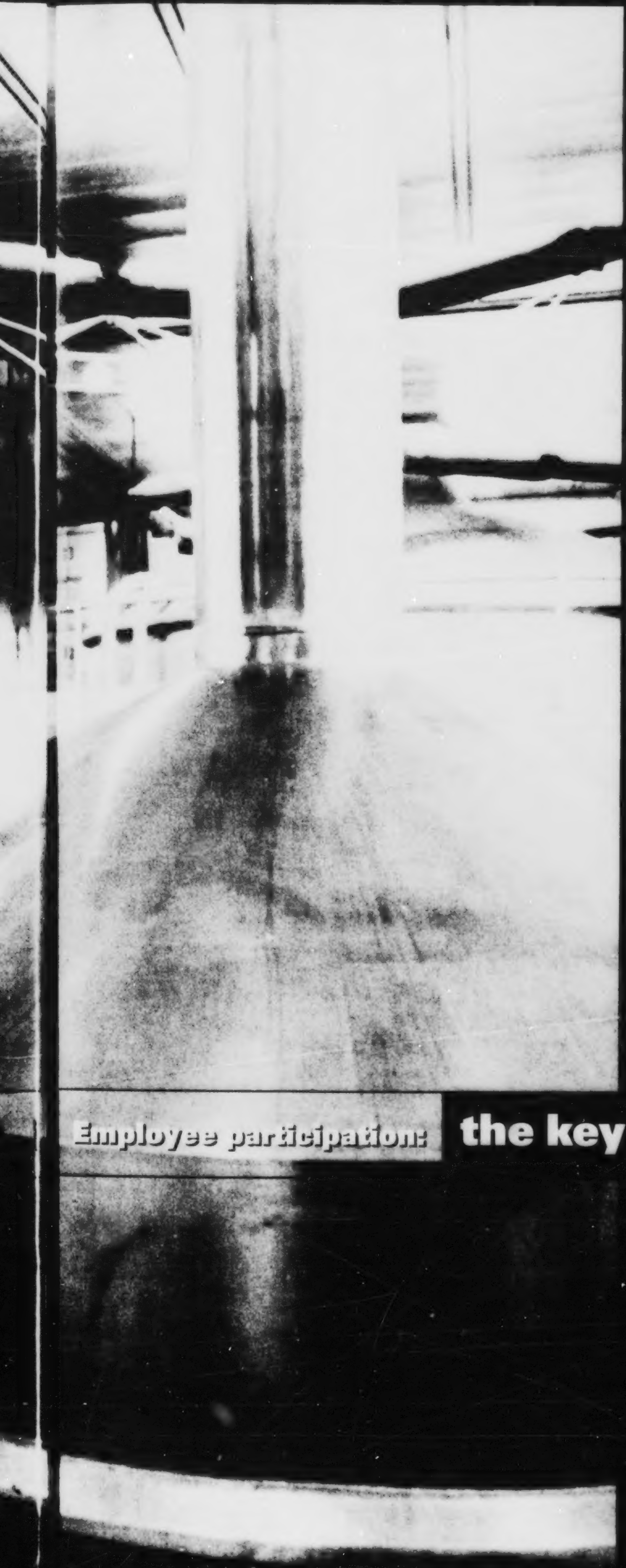
Seeing opportunities for substantial energy cost reductions at the LaSalle plant, EMCO began by collecting basic energy usage data, then analysing it to pinpoint potential savings. The data revealed opportunities for energy cost reductions in virtually every corner of the plant's operations—from refining prices in energy utility contracts to investing in more efficient equipment—all of which will improve operating practices and maintenance procedures. An energy action plan is now addressing these opportunities.

Minimizing leakage and heat loss from the plant's steam and condensate system, along with better recovery of hot condensates, will save the plant tens of thousands of dollars every year. Improved efficiency and a new heat reclaimer in its combustion system will save thousands more. The plant is also introducing compressor, motor and insulation programs focused on eliminating wasted energy and cutting costs. Many of these gains can be achieved with minimal investment simply by initiating procedural improvements.

first step in journey toward energy efficiency

EMCO has established a 1% per year improvement in energy efficiency as its corporate goal. The model now being developed at the LaSalle plant could be the blueprint that enables the company to not only meet this target but exceed it.

LABATT



An audit of its powerhouse equipment and utility distribution systems in the early 1990s led Labatt Breweries of Canada to launch vigorous energy and water efficiency programs. The company sought to cut its production costs and at the same time reduce greenhouse gas emissions.

Beginning in 1992, Labatt launched an awareness campaign designed to help brewery employees understand the importance of energy efficiency and to encourage their participation in energy conservation programs. The company also began investing capital in the expansion of its network of flow meters, enabling breweries to measure power and water usage rates by department and even by machine. Labatt is following this program with the installation of utility monitoring and targeting software in all of its breweries.

The combination of management focus, employee participation and new equipment has paid significant dividends. Since 1991, the amount of water required to produce one hectolitre of beer has dropped from 13.4 to 9.3 hL, while fuel and electricity usage has decreased from 294.3 MJ/hL to 227.7 MJ/hL. Even excluding the reduction in effluent surcharges, savings generated by the program amount to $5.5 million annually.

Employee participation: the key to energy efficiency

Friendly competition among Labatt's breweries continues to foster further energy efficiency gains. By identifying one brewery as the facility with the "best practices," other breweries are encouraged to catch up, leading to a cycle of continuous improvement in energy efficiency across the company.

LAFARGE CANADA INC.

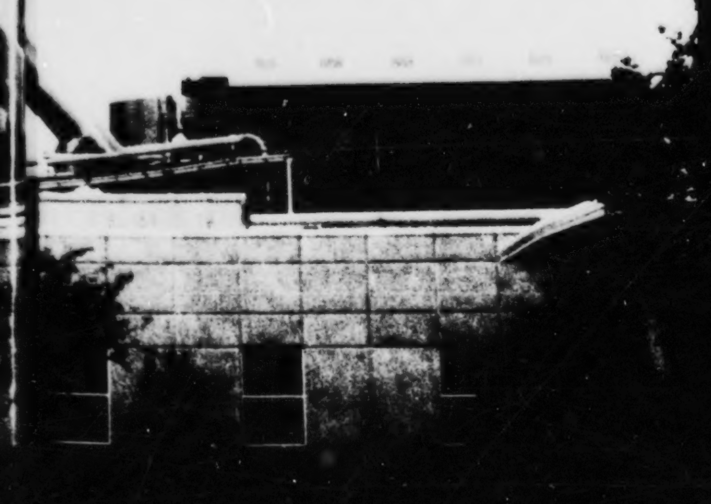
Thanks to a comprehensive company-wide program, Lafarge Canada Inc. has made impressive gains in energy efficiency. Now, thanks to a $140-million investment at its plant in Richmond, B.C., the world's second largest producer of cement will significantly enhance those gains.

Dry kiln technology slashes energy consumption

Lafarge replaced older, wet slurry "long" kilns with a modern, dry-process "short" kiln at the 40-year-old B.C. plant. In the wet slurry process, water is mixed with raw material to homogenize the mix and simplify material movement. This water must be evaporated during the manufacturing process, and is a major energy drain. Short dry kilns can operate at substantially less fuel per tonne of product than wet kilns because this energy-consuming step is not required. In addition, these kilns are equipped with higher efficiency heat exchange systems.

The results of the conversion are dramatic. The new kiln has cut energy consumption per tonne of product in half while substantially reducing regulated gas emissions. For example, SO_2 and NO_x emissions are projected to decline by more than 25% and particulate emissions will fall by more than 40%. Lafarge expects that actual experience will prove these estimates to be conservative, with overall emissions actually declining despite the doubling of production.

In addition, by converting from a wet to a dry process, the company has reduced its water usage by millions of litres per year, further minimizing its impact on the environment.



New technolo

An intensive effort to reduce its cost of operations has steered century-old Lethbridge Iron Works down an energy efficiency path.

boosts energy and manufacturing efficiency

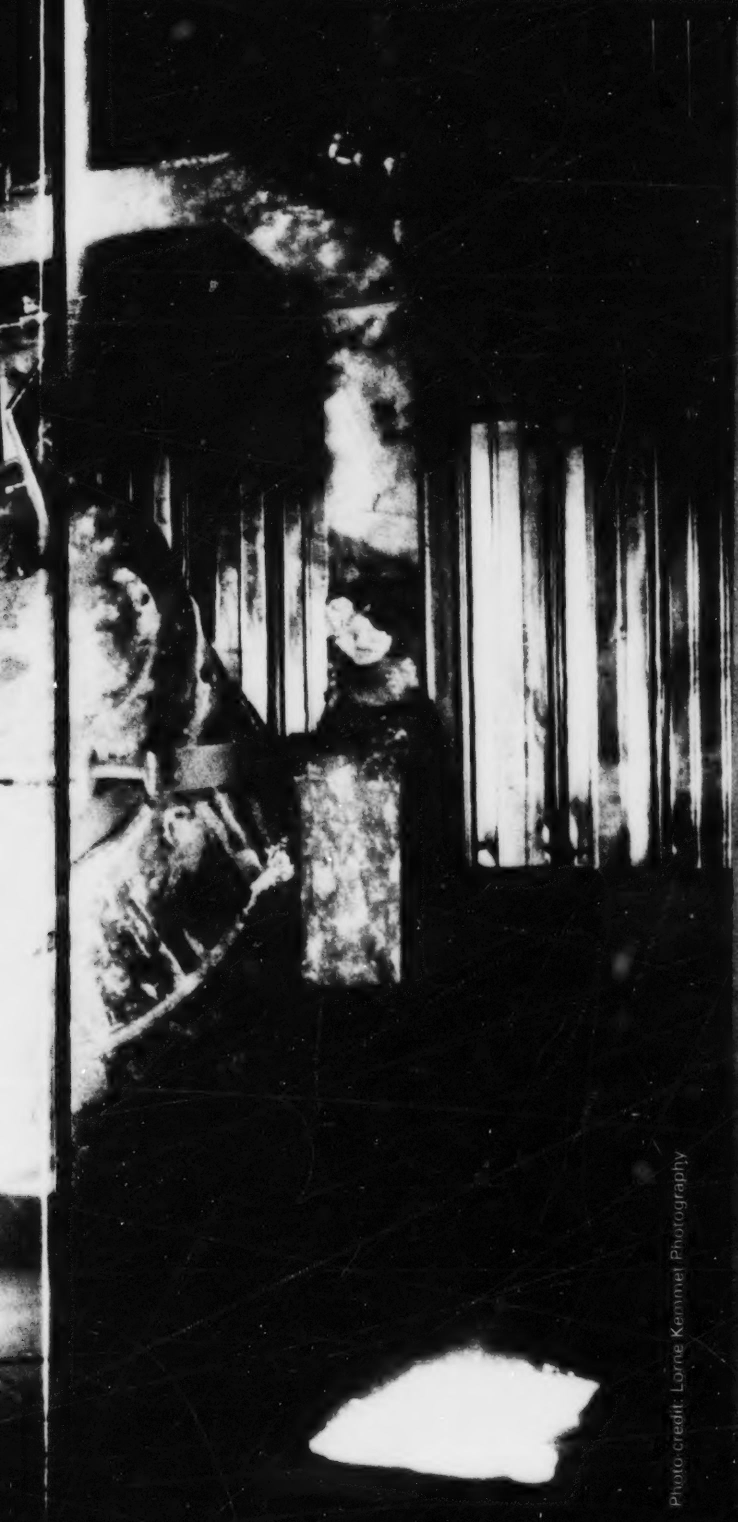


Photo credit: Lorne Kemmet Photography

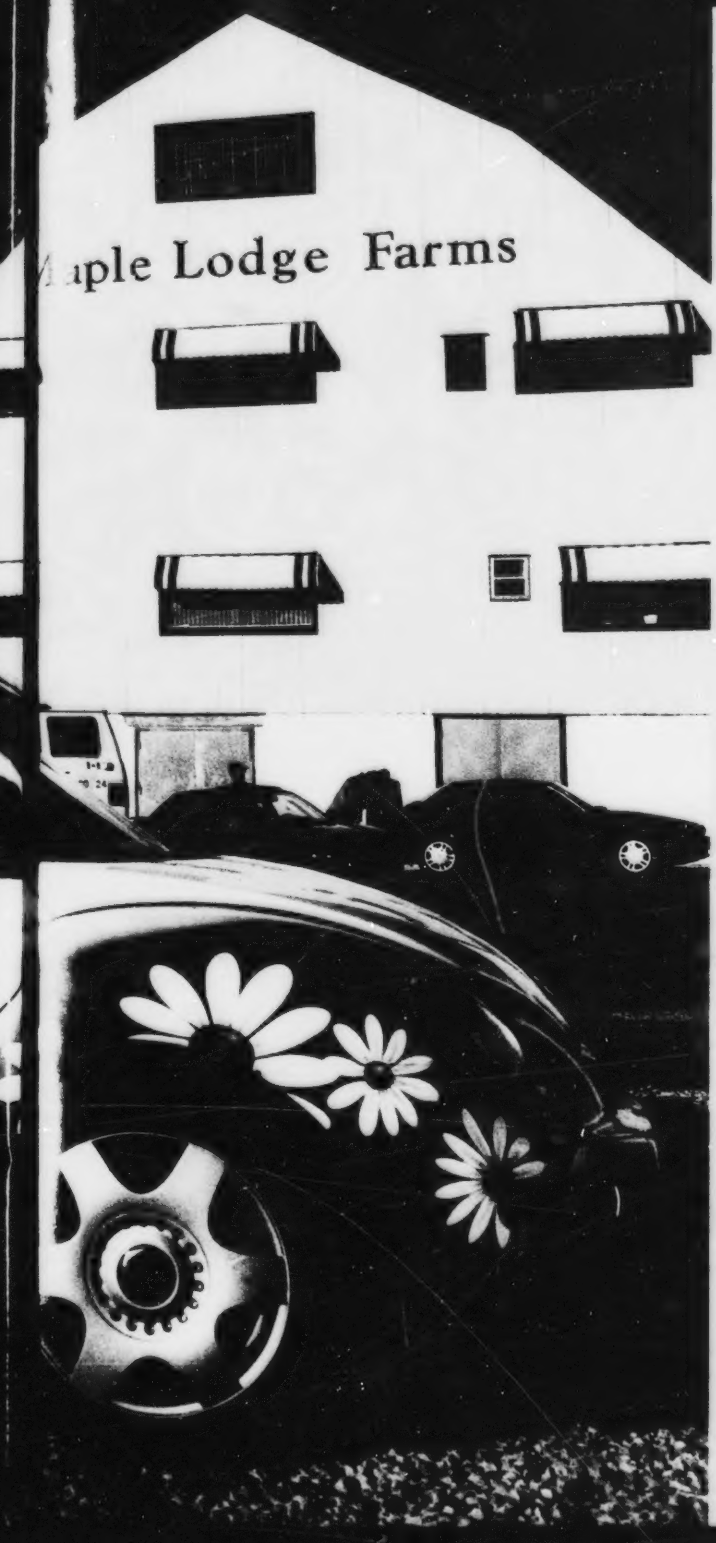
Efforts to save money led the southern Alberta foundry to introduce efficiency measures throughout its manufacturing processes. The company replaced its 70-year-old indirect arc furnaces with modern, energy-efficient coreless induction furnaces, a change that substantially reduced electrical power consumption. Nearly all process equipment has been fitted with programmable logic controllers, which automatically start and stop equipment as required, ensuring that it is running and consuming electricity only when production is underway. The company also scrapped an inefficient pneumatic return sand transport system and installed more power-efficient belt and bucket elevators.

A close look at its air handling systems led the foundry to install an automated damper system on its air compressors to keep process heat in the building during the winter. Makeup air units, which produced temperatures from 20°C to nearly 30°C, were recalibrated to perform at their specified 16°C. Old heating equipment was scrapped and replaced with modern, energy-efficient furnaces and heating units. Incandescent lighting was removed and high-efficiency compact flourescent systems were installed.

There is no doubt that aggressive energy efficiency efforts have enabled Lethbridge Iron Works to achieve substantial cost savings. With an ongoing program that builds energy efficiency into the equipment selection equation, the company will continue to add to its gains well into the future.

MAPLE LODGE FARMS LT

gains control of refrigeration energy costs



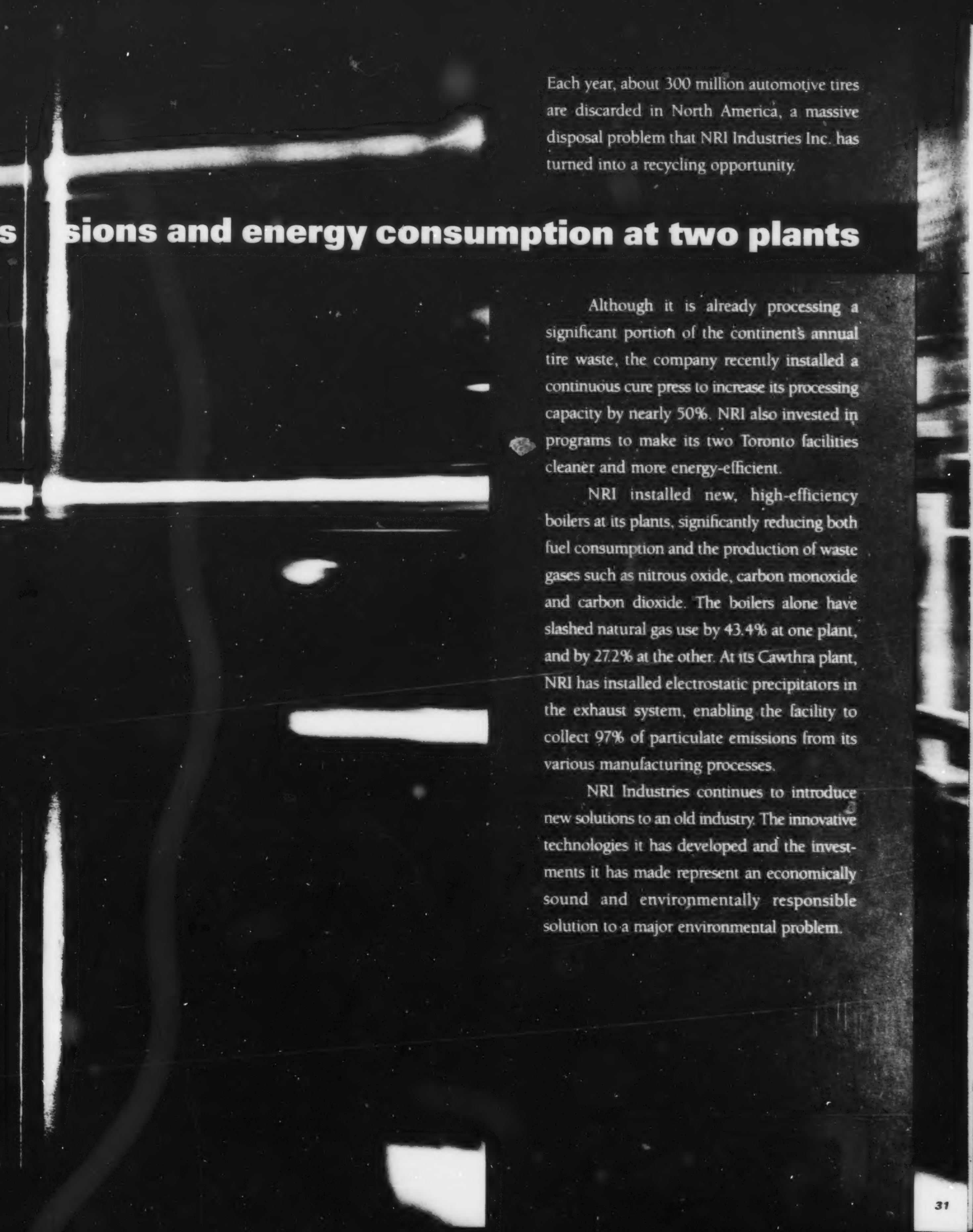
Maple Lodge Farms Ltd. faced a significant challenge. Canada's largest independent chicken processor needed to replace three independent systems with a sophisticated new control system for its refrigeration compressors without shutting down the plant or disrupting production. The results have been spectacular.

The company began by installing a Hench Controller Module from DML Control Inc. in Guelph, Ontario, for the plant's 2,900-hp refrigeration compressors. Incorporating an advanced sequencing strategy, the new module computes millions of possible permutations and automatically establishes the most efficient operating configuration. By taking advantage of inherent efficiencies available through the laws of refrigeration and the individual equipment at the site, the Hench system delivers more accurate pressure control and maximum operating efficiency.

Improvements were obvious from the first day of operation, as the company recorded an immediate 20% improvement in compressor efficiency. But that was just the beginning of the savings. Increased suction pressure has led to further annual compressor energy reductions of 8%. In addition, the system's sophisticated automatic sequencing control enables one or two compressors to handle loads previously carried by three, providing the plant with a total of 20% to 40% savings in annual compressor operating requirements.

Maple Lodge Farms estimates that its fully installed refrigeration control system paid for itself in energy savings within the first year, leading the firm to multiply its savings by installing additional Hench Controller Modules on its condensers and air compressors.

INDUSTRIES INC. | Investment slashes emi



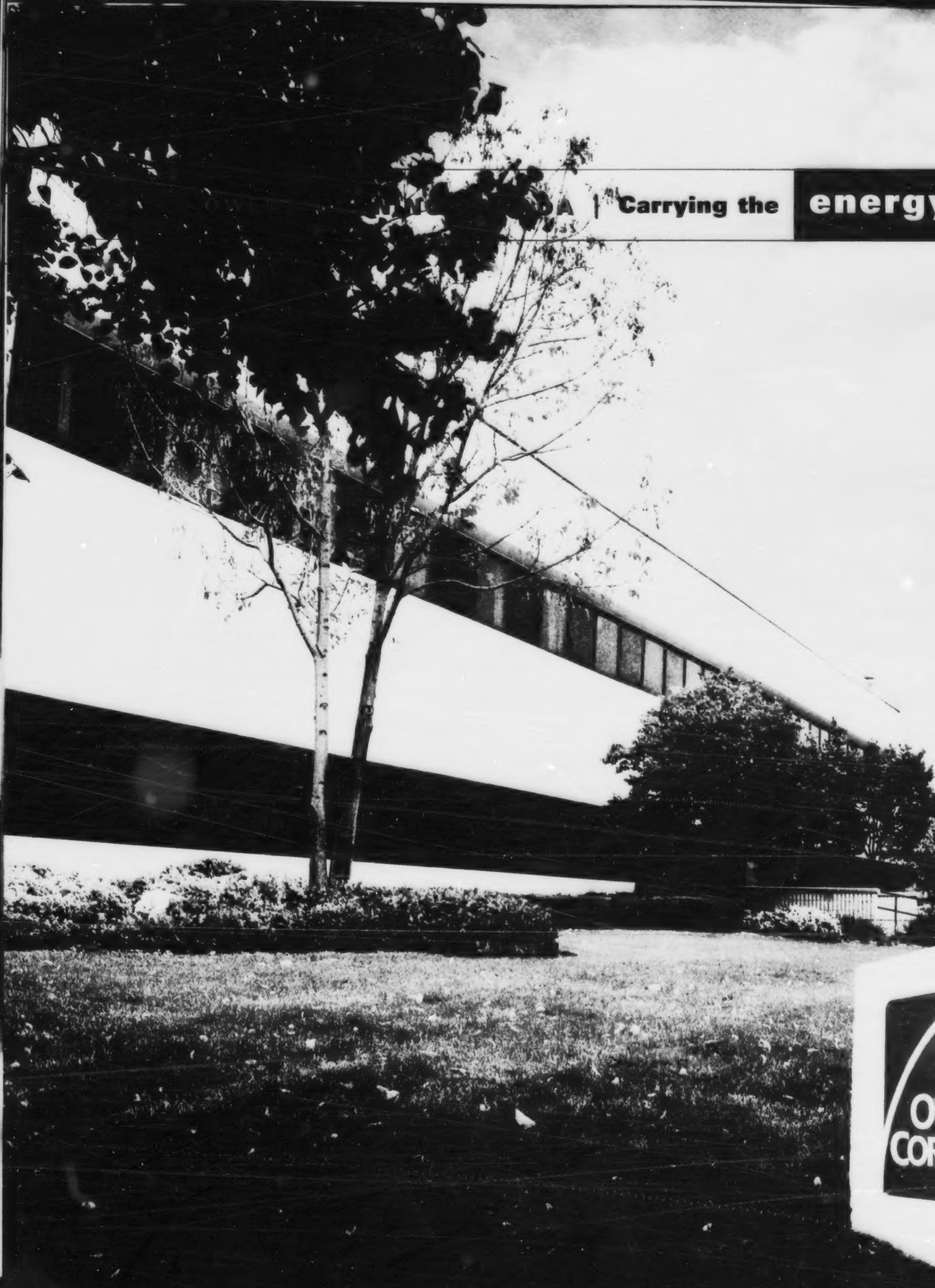
Each year, about 300 million automotive tires are discarded in North America, a massive disposal problem that NRI Industries Inc. has turned into a recycling opportunity.

s sions and energy consumption at two plants

Although it is already processing a significant portion of the continent's annual tire waste, the company recently installed a continuous cure press to increase its processing capacity by nearly 50%. NRI also invested in programs to make its two Toronto facilities cleaner and more energy-efficient.

NRI installed new, high-efficiency boilers at its plants, significantly reducing both fuel consumption and the production of waste gases such as nitrous oxide, carbon monoxide and carbon dioxide. The boilers alone have slashed natural gas use by 43.4% at one plant, and by 27.2% at the other. At its Cawthra plant, NRI has installed electrostatic precipitators in the exhaust system, enabling the facility to collect 97% of particulate emissions from its various manufacturing processes.

NRI Industries continues to introduce new solutions to an old industry. The innovative technologies it has developed and the investments it has made represent an economically sound and environmentally responsible solution to a major environmental problem.


DA | Carrying the energy
O
COR

efficiency message to future generations

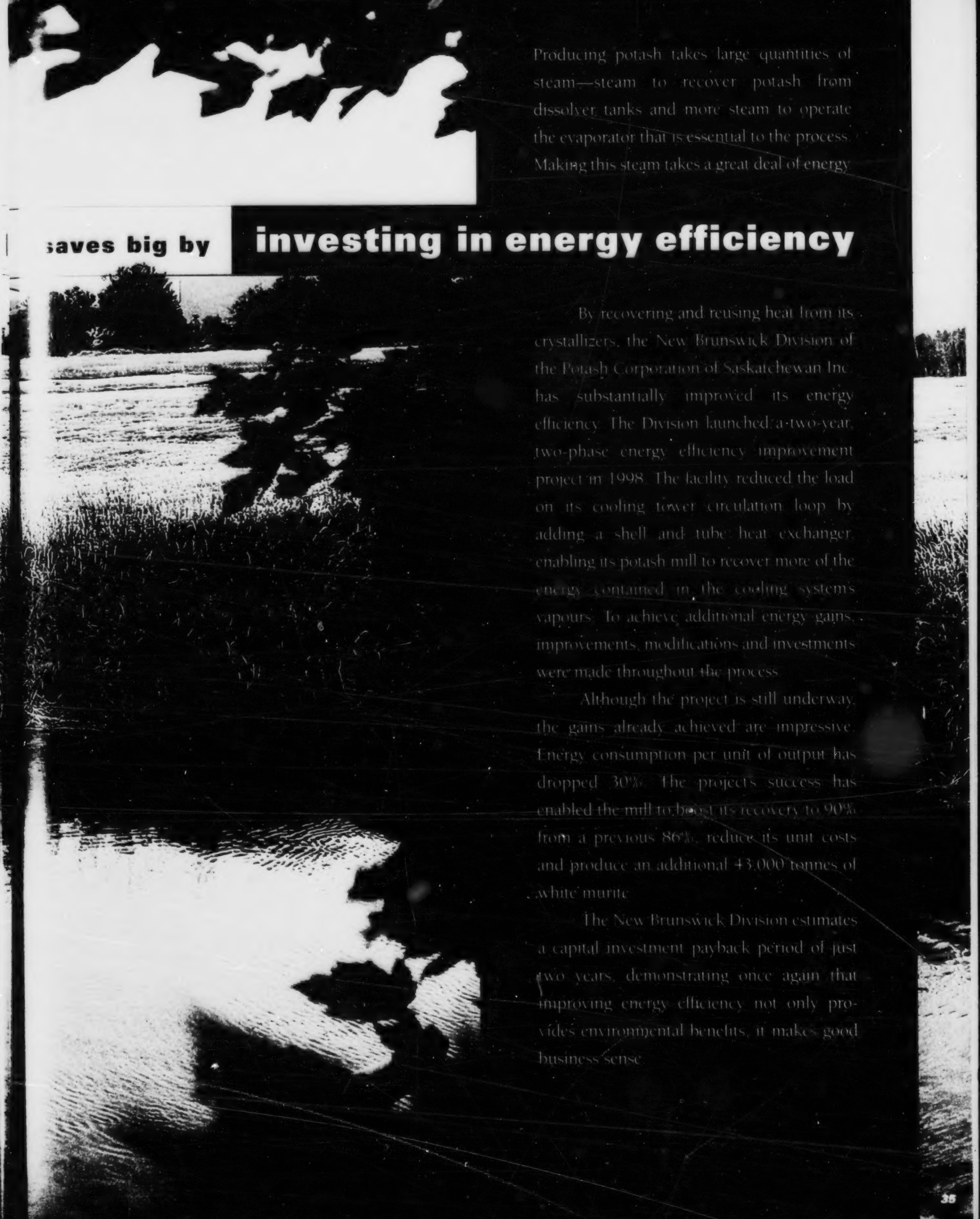
As a manufacturer of insulation for home, mechanical and commercial applications, Owens Corning Canada is intimately involved in energy conservation. By helping to minimize heat loss, the company's products have enabled customers across Canada to reduce their energy consumption. In addition, Owens Corning continues to improve the energy efficiency of the facilities and processes that make up its own operations.

But one of the company's most significant contributions to the future of energy efficiency lies in a program it has sponsored for the past 20 years in conjunction with Lester B. Pearson Collegiate. Each year, dozens of grade nine geography students participate in a contest that awards prizes to the top eight submissions with an energy theme. Winning projects are generally outstanding, and the 1999 winners are no exception. An intricately detailed scale model home demonstrating energy leak points, and a dazzling working wind power model took this year's top prizes.

Winning entries are mounted in the lobby at Owens Corning's Scarborough plant, a display that never fails to attract the attention and respect of plant staff and visitors alike.

By encouraging students to focus their attention on energy and rewarding them for the creativity and hard work they apply to their projects, Owens Corning is helping to make energy a top-of-mind concern for future generations of leaders.

New Brunswick Division of the | POTASH CORPORATION OF SASKATCHEWAN INC



Producing potash takes large quantities of steam—steam to recover potash from dissolver tanks and more steam to operate the evaporator that is essential to the process. Making this steam takes a great deal of energy.

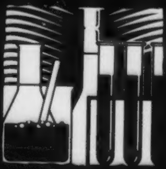
saves big by investing in energy efficiency

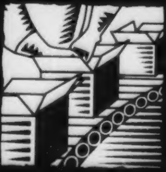
By recovering and reusing heat from its crystallizers, the New Brunswick Division of the Potash Corporation of Saskatchewan Inc. has substantially improved its energy efficiency. The Division launched a two-year, two-phase energy efficiency improvement project in 1998. The facility reduced the load on its cooling tower circulation loop by adding a shell and tube heat exchanger, enabling its potash mill to recover more of the energy contained in the cooling system's vapours. To achieve additional energy gains, improvements, modifications and investments were made throughout the process.

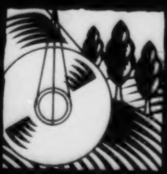
Although the project is still underway, the gains already achieved are impressive. Energy consumption per unit of output has dropped 30%. The project's success has enabled the mill to boost its recovery to 90% from a previous 86%, reduce its unit costs and produce an additional 43,000 tonnes of white murite.

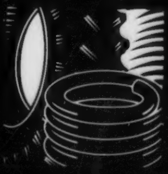
The New Brunswick Division estimates a capital investment payback period of just two years, demonstrating once again that improving energy efficiency not only provides environmental benefits, it makes good business sense.

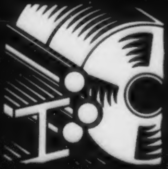
CEMENT

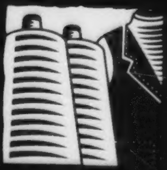




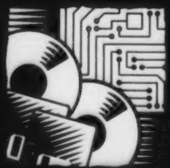


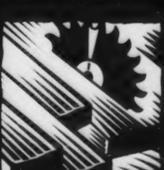






reports





***PROFILE** Canada's aluminum sector ranks fourth in the world in annual primary aluminum production. The combined output of the industry's 10 aluminum plants in Quebec and one in British Columbia is a major contributor to Canada's national and local economies. While production increases have forced the industry's total energy usage slightly upward, measurements of energy efficiency continue to demonstrate much improved performance compared with the benchmark 1990 levels.*

ALUMINUM

ACTIONS Reductions in the electrical power needed to produce aluminum can have a substantial impact on production costs. This fact has helped spur cooperative efforts to achieve industry-wide improvements in energy efficiency. In 1998, the aluminum sector set as its goal a 0.1 percent per year improvement in energy efficiency.

Individually and collectively, members of the aluminum sector continue to actively pursue energy efficiency improvements toward this goal. Ongoing process improvements are chipping away at energy consumption, while capital improvements are dramatically improving the industry's performance.

For example, Alcan Aluminium Limited will construct a new, $2.6 billion smelter in Alma, Quebec. With a rated capacity of 376 000 tonnes of primary aluminum, this smelter will use energy-efficient AP-30 Pechiney technology and enable the company to close its old, less efficient Isle-Maligne facility.

Cooperative efforts are also reducing energy intensity. Through committees, working groups and special studies, the aluminum industry is actively monitoring and pursuing technological advances that promise enhanced energy efficiency. Within member companies, committees are working on energy efficiency issues, and companies regularly share energy efficiency information in non-competitive areas.

ACHIEVEMENTS Since 1990, the aluminum sector has reduced its emissions of tetrafluoroethane (CF_4) and hexafluoroethane (C_2F_6) by nearly 30 percent, with a target reduction totalling 50 percent by the year 2000.

From 1990 to 1998, the sector increased aluminum production by more than 51 percent while steadily reducing energy consumption per unit of production and also reducing GHG emissions per unit of production by 41 percent.

Along with improved energy efficiency in the production of primary aluminum, the sector has also set the expansion of aluminum recycling as a sectoral priority. Aluminum is fully recyclable, and reforming scrap into useful metal requires only 5 percent of the energy consumed in the production of primary aluminum.

In addition, the aluminum industry has targeted the eventual elimination of anode effects, which generate CF_4 and C_2F_6, helping to reduce its GHG emissions and carbon dioxide (CO_2) equivalent. The sector believes it is in an excellent position to meet Canada's commitment to reduce greenhouse gas emissions to a total of 6 percent below 1990 levels by 2012.

CHALLENGES In 1998, the sector's output was similar to 1997 levels at 2.4 million tonnes of primary aluminum, but low prices on the world market reduced the value of production to $5.2 billion. Weaker prices will have an impact on the industry's progress toward energy efficiency. While small gains will continue to be realized through enhanced processes, the most significant improvements will come from the construction of new, state-of-the-art smelters and the phasing out of older facilities. This activity requires large capital investments and the availability of large quantities of electricity at highly competitive prices. Low aluminum prices will challenge the industry's ability to finance these investments.

Moreover, 70 percent of total aluminum production already comes from modern facilities, and developing effective economic models for the continued introduction and funding of new facilities remains a significant industry challenge.

The aluminum industry estimates that the production of each tonne of aluminum consumed on average less than 67 GJ. This demonstrates a slight decrease in energy use while the sector's total 1998 production increased.

Owing mainly to the erroneous classification of some Alcan facilities, the data on energy consumption published last year and this year are incorrect. In 1999, Alcan and Statistics Canada agreed on a revised classification of the Alcan facilities to resolve the problem.

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FACTS

PERFORMANCE HIGHLIGHTS

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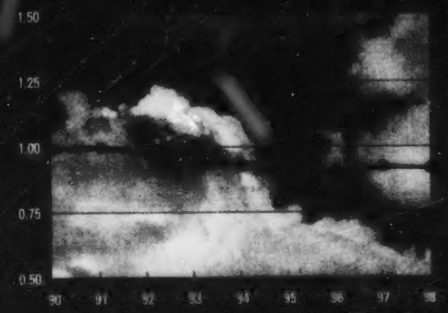
- Measurements of energy efficiency demonstrate much improved performance compared with benchmark 1990 levels.
- Alcan will construct a new, $2.6-billion smelter in Alma that will use energy-efficient AP-30 Pechiney technology.
- Through committees, working groups and special studies, the industry is actively pursuing technological advances that promise enhanced energy efficiency.
- Since 1990, the sector has reduced its CF_4 and C_2F_6 emissions by nearly 30 percent.
- From 1990 to 1998, the sector increased production by 51 percent while reducing its GHG emissions per unit of production by 41 percent.

FIGURES

Energy Intensity Index (Base Year 1990=1.00)



Energy Intensity and Production

Energy Sources in Terajoules (TJ)

FIGURES

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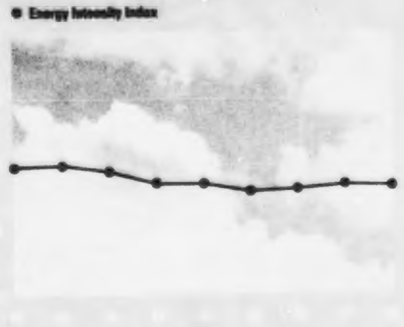
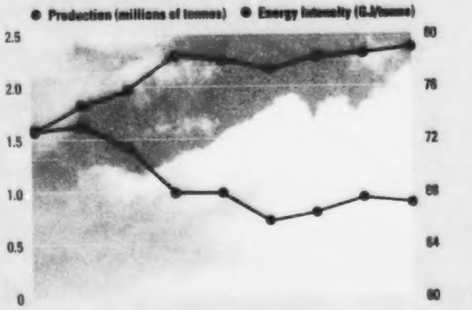
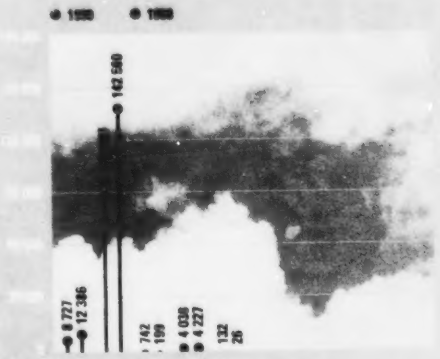


Energy Intensity and Production

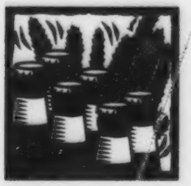


Energy Sources in Terajoules (TJ)



PROFILE *Brewing in Canada is a diverse and modern industry actively pursuing ambitious energy efficiency targets. The industry is made up of two national brewing companies, several regional brewers and numerous micro breweries. Together, these establishments employ nearly 17 000 workers in 78 breweries across Canada.*

BREWERY



ACTIONS In 1998, Canada's brewers continued to invest in efforts to improve energy efficiency. Various brewers made capital investments and undertook significant projects in a number of areas, including

- the installation of equipment to recover condensate and steam in areas where such opportunities exist;
- the replacement of older equipment with new, more energy-efficient alternatives;
- the removal of unnecessary lighting; and
- the replacement of lighting equipment with more energy-efficient alternatives.

Rigorous maintenance and monitoring activities also remained a focus. Enhanced metering, monitoring and control equipment and procedures have enabled brewers to identify opportunities for improvement and implement energy-saving measures. Energy audits and the establishment of energy accountability centres are sharpening the focus on energy waste reduction and creating opportunities for innovation in the pursuit of energy conservation.

The industry has also remained active in energy efficiency initiatives collectively. In November 1998, the Brewers Association of Canada Environment Committee, with NRCan support, released an energy efficiency guide for brewers. The guide highlights a vast array of energy-saving opportunities and identifies ways that energy efficiency activities can reduce costs within a brewery. The guide is an excellent reference for individual energy efficiency action plans and will further efforts to sustain the sector's energy reduction performance.

ACHIEVEMENTS Canada's brewing industry continues to trim the amount of fuel and electricity consumed despite several years of stagnant production. The sector's energy mix includes 71 percent natural gas, 6 percent fuel oil and 23 percent electricity.

Since 1995, the industry has reduced its energy consumption by 6.7 percent while improving its economic efficiency. The brewing industry is committed to an energy reduction of 1 percent per year over the next three years and, beginning in 2004, 1.5 percent annually for three more years.

CHALLENGES Cost control is a priority for the brewing industry. Flat sales since about 1975, greater competition from foreign brewers, increased competition from other products such as coolers, and growth in non-taxed alternatives such as beer produced from kits and at u-brews have combined to weaken both sales and profitability.

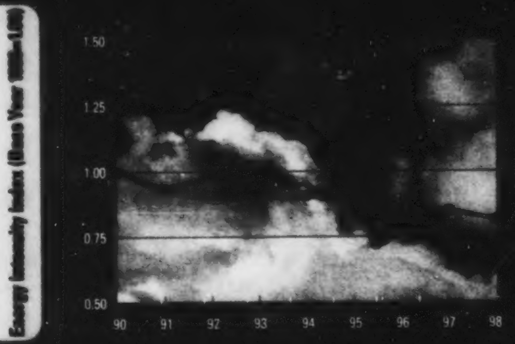
Brewers have responded to these challenges by developing export strategies that make Canada one of the top beer exporters in the world. Canada's brewers have also negotiated agreements that enable them to produce a number of products in Canada that would otherwise be imported. With more than 400 distinct brands now available in the Canadian market, from traditional ales and lagers to new products with varying strengths of alcohol, flavours and textures, the industry is well positioned to meet its competition head on. Product and marketing innovations notwithstanding, energy remains a substantial cost component in the brewing process. Finding ways to improve energy efficiency is, therefore, a priority for Canada's brewers.

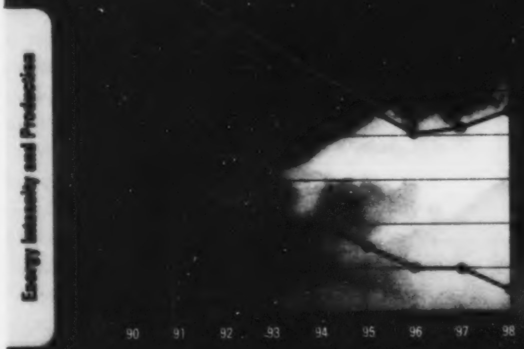
FACTS

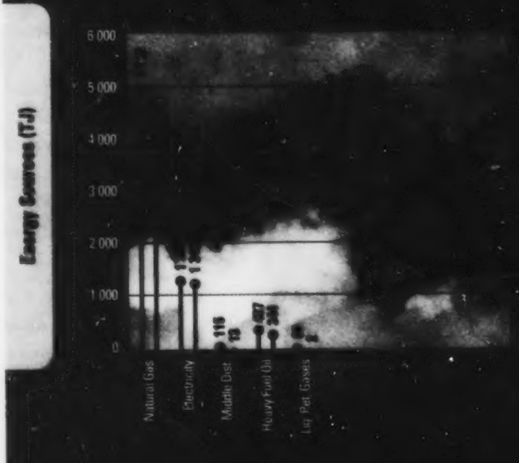
PERFORMANCE HIGHLIGHTS

- The brewery sector employs nearly 17 000 workers in 78 breweries across Canada.
- Enhanced metering, monitoring and control equipment and procedures have enabled brewers to identify opportunities for improvement and implement energy-saving measures.
- In November 1998, the Brewers Association of Canada Environment Committee, with NRCan support, released an energy efficiency guide for brewers.
- Since 1995, the industry has reduced its energy consumption by 6.7 percent while improving its economic efficiency.
- The industry is committed to an energy reduction of 1 percent per year over the next three years and, beginning in 2004, 1.5 percent annually for three more years.

FIGURES







FACTS

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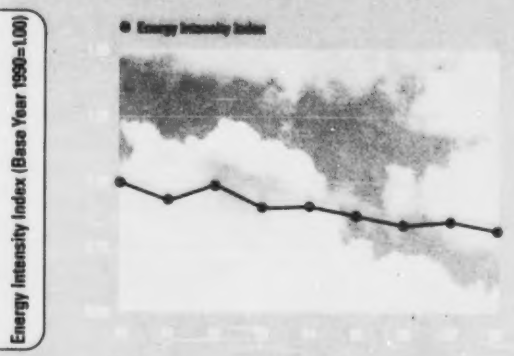
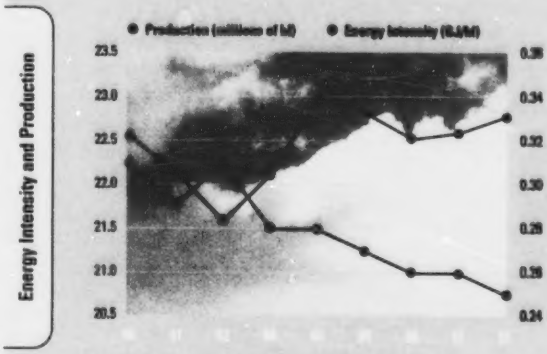
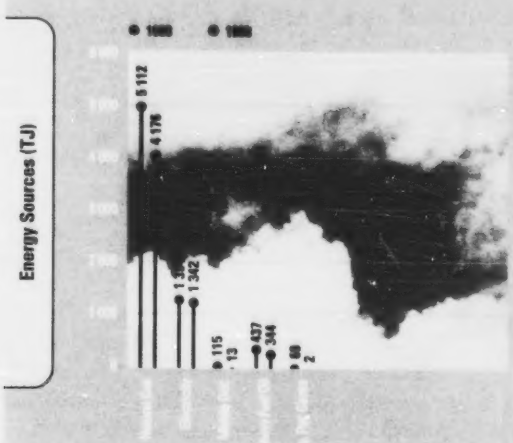
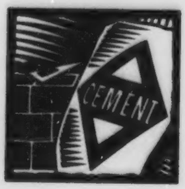

Energy Intensity Index (Base Year 1990=1.00)


Energy Intensity and Production


Energy Sources (TJ)

PROFILE *The cement industry is the cornerstone of Canada's domestic construction industries and a significant exporter that contributes substantially to the country's balance of payments. The industry's nine companies, which operate 17 manufacturing facilities with a combined production capacity of 12.1 million tonnes of clinker, saw a 2.5-percent increase in shipments in 1998.*

CEMENT



ACTIONS Cement manufacturers continued to invest in energy efficiency in 1998. For example, at Blue Circle Canada Inc.'s Bowmanville, Ontario, facility, the company replaced the inlet fan damper in the coal mill with a variable inlet vane damper, reducing power consumption and saving the company approximately $75,000 in energy expenditures.

At its Picton, Ontario, facility, ESSROC Canada Inc. installed an electricity-use monitoring system that is now helping the plant improve its electrical energy efficiency.

A new, energy-efficient dry kiln is now in operation at Lafarge Canada Inc.'s Richmond, B.C., plant, replacing the plant's older wet kilns. When preliminary numbers are analysed, Lafarge Canada expects the new kiln to cut energy consumption per tonne of clinker in half.

Tilbury Cement Limited in Delta, British Columbia, has eliminated approximately 6 percent of its fossil fuel consumption by recovering energy from waste oil and discarded tires.

The cement sector is also actively promoting energy issues through its industry association. The industry participates in the "Buildings Industry Table" developed by the government in response to the challenge of the Kyoto Protocol and holds regular environmental committee meetings. The Canadian Portland Cement Association is also actively involved in collecting information related to energy savings, emissions and the energy-efficient application of its products.

Among the association's recent projects are "Environmental Life Cycle Assessment of Concrete Products: Portland Cement Concrete and Asphalt and Concrete Pavements," "Environmental Life Cycle Assessment of Concrete Products: Portland Cement Concrete and Wood Residential Structures," and "CO_2 Literature Search Regarding CO_2 Sinks" as they relate to concrete structures.

ACHIEVEMENTS The Canadian Portland Cement Association estimates that by 2000, total emissions associated with domestic cement consumption will be 6 percent below 1990 levels. This projection is based on an estimated 12 percent increase in domestic consumption between 1997 and 2000. Associated emissions per tonne of concrete product should show a 14 percent decrease in CO_2 compared with 1990. Moreover, clinker capacity utilization rates increased by an impressive 4 percent from 1997 to 1998, whereas cement shipments rose 2.5 percent.

Within the industry, cement manufacturers have achieved a 30 percent energy reduction per tonne of output since the mid-1970s by converting from wet to dry manufacturing processes and improving heat-recovery systems. Emissions have been reduced by incorporating fly ash, silica fume and blast furnace slag into concrete as a supplement. Manufacturers continue to improve environmental performance by augmenting the use of waste materials and fuels in the production process.

The principal energy sources used for cement production are coal, natural gas and petroleum coke. In 1998, the use of alternative fuels (wood waste and waste fuel) increased to 6 025 terajoules (TJ), or 9.7 percent of total energy used. Since 1990, the cement sector has reduced its total energy use by more than 4.7 percent.

The expanded use of activities such as power monitoring and targeting will lead to further energy efficiency opportunities within the sector. The industry expects further increases in energy efficiency as companies continue to modernize their facilities and processes.

CHALLENGES The cement sector's energy intensity target is an improvement of 0.7 percent per year through the year 2000. Success in reaching this goal depends on continued strong demand for the industry's products, along with the acceptance of standard methodologies for measuring waste fuel efficiencies and energy embodied in export products.

Long-standing discussions among waste producers and waste users have not yet yielded an appropriate methodology to establish emission-related credits for waste material use in the production of cement. In a broader context, complex international negotiations continue to delay the establishment of standardized accounting methods for energy embodied in cement exports. Additionally, the potential implementation of economic instruments such as a "carbon tax" could seriously impair Canada's cement exports.

Moreover, while many cement producers would gladly expand the use of waste materials such as discarded tires as fuel, landfill fees for discarded tires are too low in many jurisdictions to provide the financial incentives to encourage such use.

Despite the obstacles, the industry continues to promote concrete as an energy-efficient product and to make cement and concrete the materials of choice for environmentally responsible industries. It is also continuing to develop an appropriate methodology for life cycle assessment of cement-based materials and products.

FACTS

PERFORMANCE HIGHLIGHTS

- The cement sector saw a 2.5-percent increase in shipments in 1998.
- Blue Circle Canada reduced power consumption at its Bowmanville facility, saving the company $75,000 in energy expenditures.
- ESSROC Canada installed an electricity-use monitoring system that is now helping its Picton plant improve its electrical energy efficiency.
- Lafarge Canada's new Richmond kiln will cut energy consumption per tonne of clinker in half.
- B.C.'s Tilbury Cement has cut fossil fuel consumption by recovering energy from waste oil and discarded tires.
- The Canadian Portland Cement Association estimates that by 2000, total emissions associated with domestic cement consumption will be 6 percent below 1990 levels.

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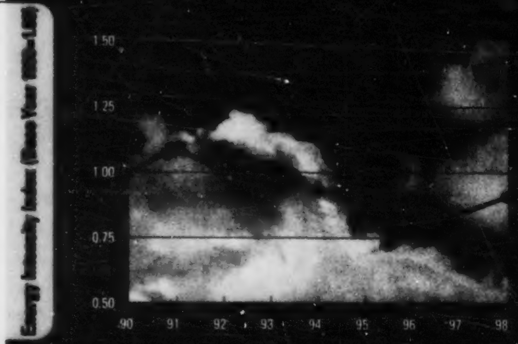

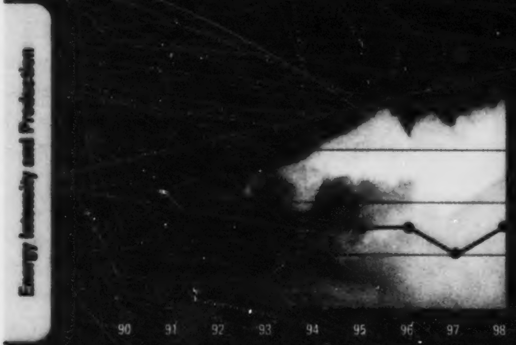

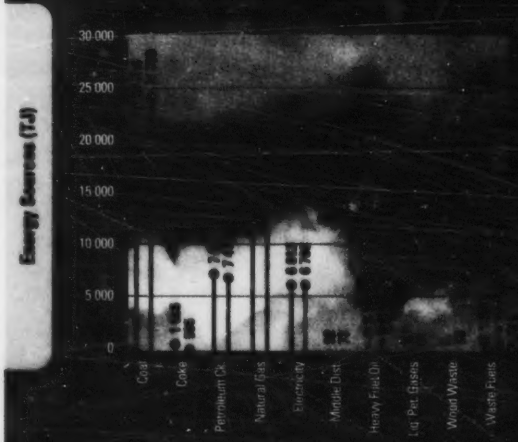

FIGURES

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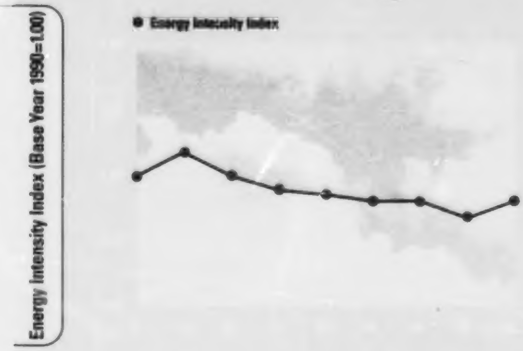
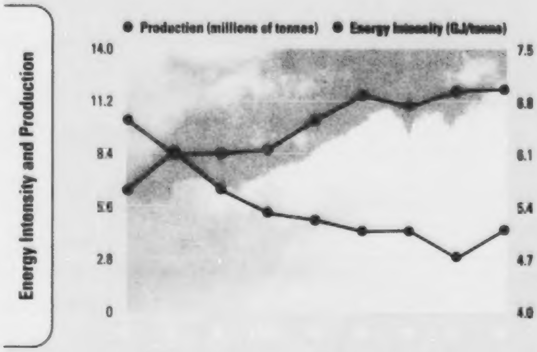
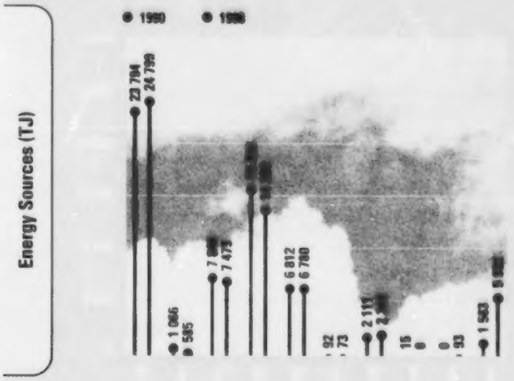






PROFILE *The chemical sector is a diverse industry producing organic and inorganic chemicals, as well as plastics and synthetic resins. Companies in this sector operate 775 facilities Canada-wide, directly employing more than 24 000 people with an annual payroll of $1.3 billion.*

CHEMICALS

ACTIONS Nearly all chemical industry subsectors are meeting their energy-intensity performance targets, matching, and in some cases substantially improving on, benchmark 1990 levels. Contributing to the sector's performance, the installation of cogeneration facilities results in more efficient use of hydrocarbon fuels to generate heat, steam and electricity. In a recent survey of Canadian Chemical Producers' Association (CCPA) members, respondents accounting for 82 percent of CO_2 emissions indicated in aggregate that 49 percent of electricity and 44 percent of steam requirements are currently being met by cogeneration. By 2010, cogeneration is expected to account for 78 percent of electricity and 67 percent of steam required.

All CCPA member companies must subscribe to the association's Responsible Care® initiative. Responsible Care® establishes guiding principles and codes of practice covering all aspects of the chemical life cycle, including the requirement that each member report annually on the emission of as many as 500 substances. A strong supporter of the VCR Inc., the CCPA requires members that are large emitters of CO_2 to register and encourages members with lower emissions to do so as well.

Individual manufacturers have also taken noteworthy actions in 1998, for example,

- NOVA Chemicals Corporation plans to build a $355 million cogeneration plant at its Joffre, Alberta, site. This facility will not only supply all of the site's steam and electricity needs but also will supply electricity to the Alberta Interconnected System, reducing indirect emissions of GHGs by system users by approximately 2 546 kilotonnes annually. NOVA has also initiated a flare-reduction program at its Corunna, Ontario, facility aimed at reducing emissions (consisting mostly of C4s, ethylene and propylene) and improving fuel efficiency. Under the program, measures have been taken to reduce fuel gas system pressures, to minimize flaring at start-up, to quickly identify flare sources and to report monthly to management. Compared with 1998, year-to-date flare losses have been reduced by $3 million and approximately 14.6 kilotonnes. The project team will continue its work in 2000.
- DuPont Canada Inc. is continuing to improve the efficiency of the nitrous oxide abatement facility started in 1997 at its Maitland, Ontario, site. The facility attained 53.7 percent abatement efficiency in 1998, with a goal of 90 percent in 2000. In addition, DuPont expects to achieve a 15 percent reduction in unit energy use between 1995 and 2005.
- Dow Chemical Canada Inc. has committed to improve energy efficiency per kilogram of product manufactured by 20 percent from 1994 to 2005. One project that will help accomplish this goal is the construction of a highly efficient cogeneration facility at Dow's Fort Saskatchewan site. This facility is expected to reduce Dow's attributed CO_2 emissions by approximately 400 kilotonnes per year.

ACHIEVEMENTS The chemical sector continues to combine capital investment and innovative process improvements to keep reducing its emissions per unit of output. In addition, the sector and its trade association remain focused on enhancing energy-use management, including public reporting on the sector's energy efficiency performance.

In 1998, the sector's energy consumption, at 219 311 TJ, was a modest increase over 1990 levels. However, the constant dollar value of its products increased substantially, about 18 percent over 1990 values and 1 percent from 1997 to 1998. Since 1992, the constant dollar value of the sector's output increased by 27 percent while its total GHG emissions in equivalent CO_2 tonnes have decreased 21 percent. Although direct CO_2 emissions increased 4 percent, emissions per unit of output decreased by 18 percent. In total, the global warming potential per unit of output has decreased by 38 percent.

Cogeneration is helping the sector to continue to register significant energy efficiency gains as well as reductions in GHG emissions per unit of output. In fact, thanks to the active stewardship of its members, the CCPA estimates that by the year 2003, CO_2 emissions per unit of output will remain at 18 percent below 1992 levels.

The chemical sector remains a staunch supporter of the VCR Inc., and companies continue to support their membership with significant actions. For example, over the past year, four CCPA companies, responsible for more than 70 percent of the sector's CO_2 emissions, attained significant Champion reporting levels: Celanese Canada Inc. and DuPont reached Silver, and Dow and NOVA reached Gold. DuPont also received a 1998 VCR Leadership Award.

For more information about climate change and the chemical industry, visit the CCPA Web site at www.ccpa.ca.

CHALLENGES Energy efficiency is closely linked to competitive patterns within the chemical industry, resulting in incremental improvements in energy-use patterns, rather than dramatic changes. Similarly, the industry's current strong growth makes it likely that while CO_2 emissions per unit of output will continue to improve, total CO_2 emissions will grow.

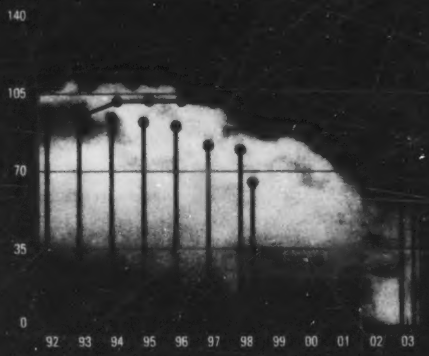
The chemical industry's use of natural gas and petroleum distillates as a feedstock complicates the creation of accurate sector energy data. To ensure accurate and consistent reporting of energy consumption, the CCPA is working with several government agencies on how to improve sector energy consumption measurement and reporting.

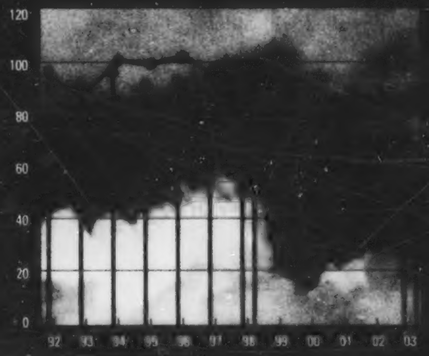
FACTS

PERFORMANCE HIGHLIGHTS

- The chemical sector operates 775 facilities Canada-wide, directly employing more than 24 000 people.
- Nearly all industry subsectors are meeting their energy-intensity performance targets.
- In aggregate, cogeneration is currently meeting 49 percent of the sector's electricity and 44 percent of its steam requirements.
- NOVA Chemicals plans to build a major cogeneration plant at its Joffre site.
- DuPont Canada continues to improve the efficiency of the nitrous oxide abatement facility at its Maitland site.
- Dow Chemical Canada has committed to improve energy efficiency per kilogram of product manufactured by 20 percent between 1994 and 2005.
- The global warming potential per unit of output in the sector has decreased by 38 percent.

FIGURES





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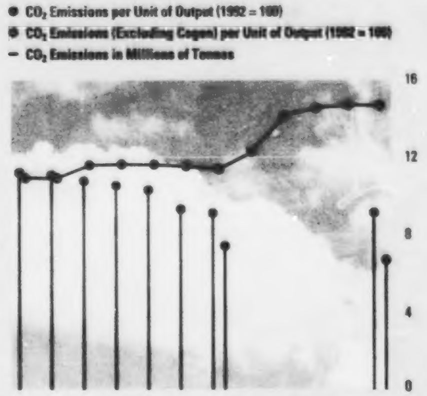
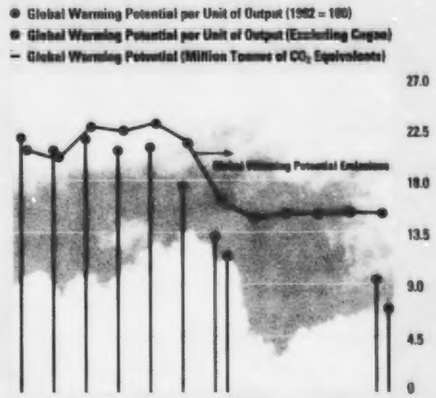
FIGURES

CO_2 Emissions in Millions of Tonnes and per Unit of Output (1992 = 100)



Global Warming Potential of Emissions from CCPA Member Operations (Shown as Equivalent CO_2 Tonnes and per Unit of Output)



Notes

1. Emission forecasts from member companies are assumed to take into account announced capacity increases.
2. Historical chemical output was calculated using constant 1992 dollars, taking into account annual average chemical pricing changes as a way of converting sales dollars into tonnage.
3. Chemical output is forecast to grow 5 percent per annum from 1997 to 2002 based only on announced projects.
4. About 10 percent of the output is from non-CCPA member companies; emissions are from member companies only.

***PROFILE** Canada's dairy product manufacturing sector spans the country from coast to coast. Employing 20 500 people in more than 270 facilities, Canada's dairies processed more than 74 million hectolitres of raw milk and shipped an estimated $8.3 billion worth of milk products in 1998.*

DAIRY

ACTIONS Dairy product manufacturers use energy for such processes as pasteurization, churning, washing, packaging, cooling, freezing and drying, making energy a key component in milk processing. Typically, dairies employ electrical, thermal and water-based energy systems in their facilities.

The importance of energy to the sector has led the National Dairy Council of Canada to promote industry-wide participation in energy efficiency efforts. Each product subsector is encouraged to implement its own low-cost, no-cost and retrofit improvements in dozens of plant operations. These improvements include everything from thermal storage of recovered hot water to exterior tanker recycled water washes and improved control of air and water leakage. Companies seeking to make such improvements are provided with information on expected cost savings and payback periods. Moreover, the National Dairy Council of Canada, in partnership with NRCan, supports the energy efficiency achievements of dairy plant managers through research and educational materials.

New energy-saving technologies, including expert control systems, non-thermal pasteurization systems, pulsed drying systems and just-in-time dairy manufacturing concepts, have also attracted the industry's attention. Training is available to help energy managers measure energy efficiency and to direct them to research from around the world on successful dairy product energy-management strategies and practices.

National Dairy Council staff and member companies are working with the Competitive Analysis Centre Inc. on an extensive examination of energy use by fluid milk processors. Through the analysis of data collected from 17 different fluid milk plants located across Canada, the study will provide dairies with valuable energy performance indicator information. The study is expected to be completed by the summer of 2000.

ACHIEVEMENTS Canadian dairy product manufacturers and marketers are facing increased competition in both domestic and world markets as increasingly liberalized international trade leads to more heavily integrated world markets. To remain competitive in an environment of rapid change, the sector has successfully lowered its costs through improved energy efficiency. Moreover, to bolster its domestic markets, Canadian dairy product manufacturers continue to reinforce the image of Canadian milk products as wholesome, high-quality, competitively priced food sources.

In 1998, the dairy product manufacturing sector's total energy consumption was 12 737 TJ, up slightly from the 1990 level of 11 952 TJ, with the amount of milk and cream produced in 1998 also up from 1990 levels. Except for a peak year in 1994, energy intensity remained at or below the 1990 level until 1996 when energy intensity increased. This increase can be attributed to production line changes made by the industry to meet consumer demand for products that require more energy to produce.

CHALLENGES Improving energy efficiency is a significant challenge for dairy product manufacturers. Industry rationalization and competitive pressures continue to drive the industry to reduce excess capacity while retaining and expanding market share. Furthermore, international scrutiny resulting from a World Trade Organization ruling against Canada's dairy export regime has created intense internal pressure on Canadian dairy industry stakeholders as they search for the best way to implement the ruling.

A fundamental challenge is inherent in the requirement for dairy product manufacturers and marketers to provide high-quality, value-added products to consumers at the best possible prices while the main source of their products is a highly regulated, supply-managed raw milk production sector.

The recent trend toward extended shelf life (ESL) products has also boosted energy consumption. Producing ESL products requires ultra-high-temperature pasteurization and the use of special filters, and such alterations in processing require significantly more energy per unit of output. All of these forces have combined to make productivity and cost reduction key industry issues.

Manufacturers have made most of the low-cost and no-cost energy efficiency improvements available to them. Their greatest challenge is to make the more costly, payback-delayed improvements, especially given the ever-increasing economic pressures of a highly competitive market.

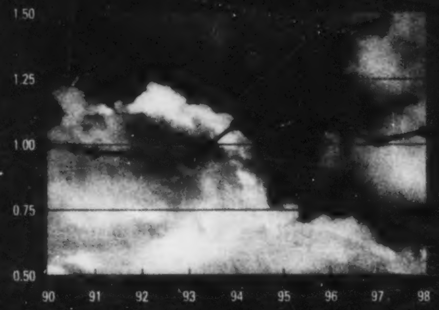
FACTS

PERFORMANCE HIGHLIGHTS

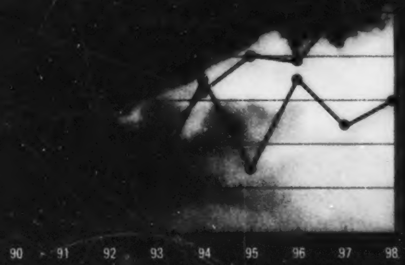
- Canada's dairies shipped products worth an estimated $8.3 billion in 1998.
- Canadian dairy product manufacturers and marketers face increased competition in both domestic and world markets as liberalized international trade leads to more heavily integrated world markets.
- National Dairy Council staff and member companies are working with the Competitive Analysis Centre on an extensive examination of energy use by fluid milk processors.
- In 1998, the sector's total energy consumption was 12 737 TJ, up slightly from the 1990 level of 11 952 TJ.
- Since 1996, energy intensity has increased owing to consumer demand for dairy products that require more energy to produce.

FIGURES

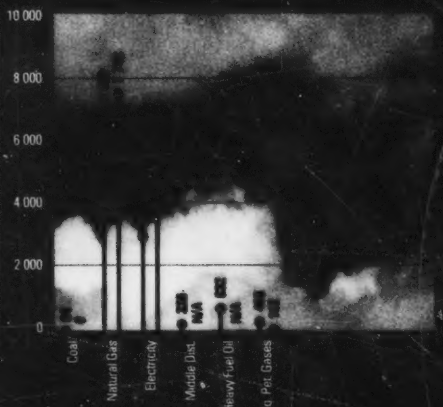
Energy Intensity Index (Base Year 1990=1.00)



Energy Intensity and Production



Energy Sources (TJ)



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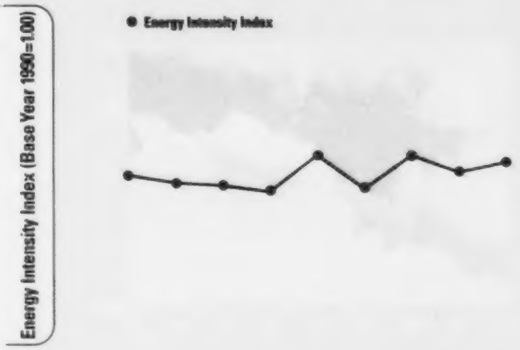
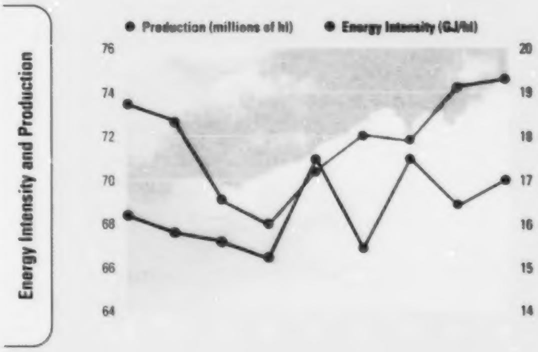
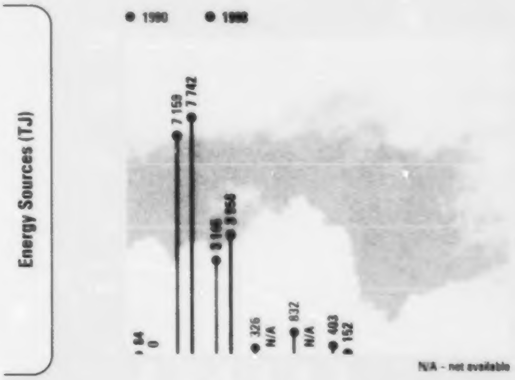
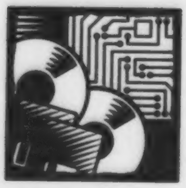






***PROFILE** The electrical and electronics sector includes a diverse array of companies that produce electrical appliances, lighting, consumer electronics, communication and electronic equipment, cabling, office equipment, industrial equipment and other electrical products. These companies operate more than 1 400 facilities employing over 119 600 workers across Canada. The industry is a major exporter and a vital, growing contributor to the national economy. In 1998, total shipments reached $15.7 billion, 13.6 percent of the total for all Canadian manufacturing.*

ELECTRICAL AND ELECTRONICS



ACTIONS Although the industry as a whole has yet to adopt increased energy efficiency as a mission-critical target, companies within the sector have launched their own energy programs. Electrical and electronics manufacturers are also acting in concert through the Electro-Federation Canada to establish and promote energy efficiency standards for consumer, commercial and industrial products.

ACHIEVEMENTS Between 1990 and 1998, the electrical and electronics sector's gross domestic product (GDP) increased by about 92 percent. In 1998, the industry consumed 17 209 TJ of energy, representing about 0.7 percent of the energy consumed by the manufacturing sector as a whole and about 0.1 percent of total energy-related manufacturing CO_2 emissions. On average, expenditures on energy are equivalent to less than 1 percent of the value of the industry's shipments, compared with more than 61 percent for materials and supplies, and 16 percent for labour. Natural gas and electricity satisfy virtually all of the industry's energy requirements.

Between 1990 and the end of 1998, the sector's energy consumption decreased by 6 percent despite substantial growth in production. These factors have combined to decrease energy intensity by almost 50 percent. Moreover, efficiencies of scale brought about by the consolidation of manufacturing operations and distribution channels (through acquisitions and mergers) led the industry to project a decrease in energy consumption of one third over the next decade. In fact, despite the challenges it faces, the electrical and electronics sector is ahead of its Kyoto commitment.

Regardless of global pressures, many corporations remain committed to environmental programs and sustainable development, and continue to include energy efficiency as a vital component of their efforts to control costs.

Many of the sector's manufacturers make a significant contribution to decreasing CO_2 emissions through the products they manufacture and sell. Products ranging from oil refinery control systems to high-efficiency motors and lighting are used directly by other companies to decrease their energy consumption.

CHALLENGES The electrical and electronics sector is Canada's least energy-intensive industry. As a result, many manufacturers consider GHG emissions and energy efficiency less critical to the industry's health than technological change, market growth, and sales and distribution issues. Many manufacturers fear that unilateral Canadian actions to reduce GHG emissions in response to the Kyoto commitment place their plants at a competitive disadvantage compared with foreign-based plants with fewer environmental constraints. And for most companies, with a primary focus on the next two fiscal quarters, the long-term commitment to targets as far as a decade away may appear unrealistic.

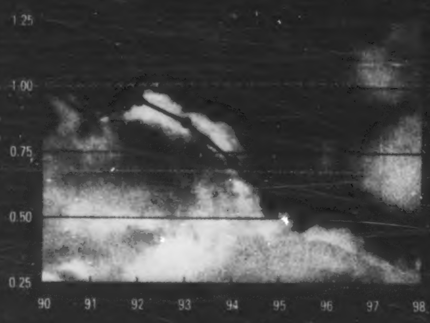
FACTS

PERFORMANCE HIGHLIGHTS

- The electrical and electronics sector is Canada's least energy-intensive industry.
- Average energy expenditures are less than 1 percent of the value of the industry's shipments, compared with more than 61 percent for materials and supplies, and 16 percent for labour.
- In 1998, total sector shipments reached $15.7 billion, 13.6 percent of the total for all Canadian manufacturing.
- Between 1990 and the end of 1998, the sector's energy consumption decreased by 6 percent despite substantial growth in production.
- Consolidation led the industry to project a decrease of one third in energy consumption over the next decade, ahead of its Kyoto commitments.
- Many sector manufacturers make a significant contribution to decreasing CO_2 emissions by increasing the energy efficiency of the products they manufacture and sell.

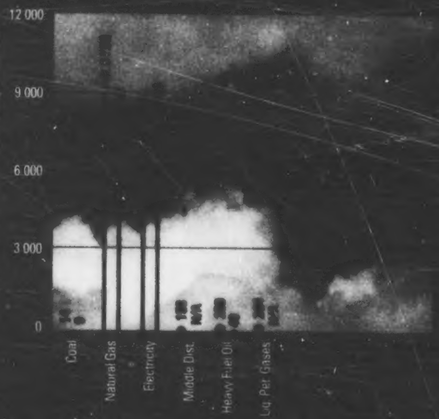
FIGURES

Energy Intensity Index (Base Year 1990=1.00)



Energy Intensity and Production

Energy Sources (TJ)

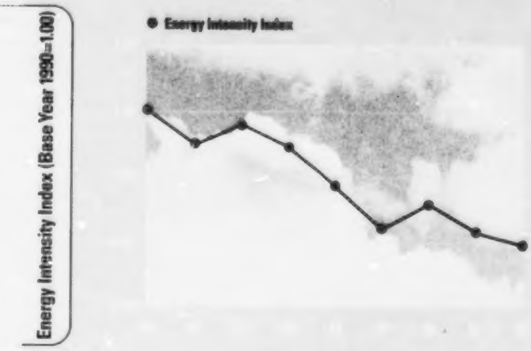


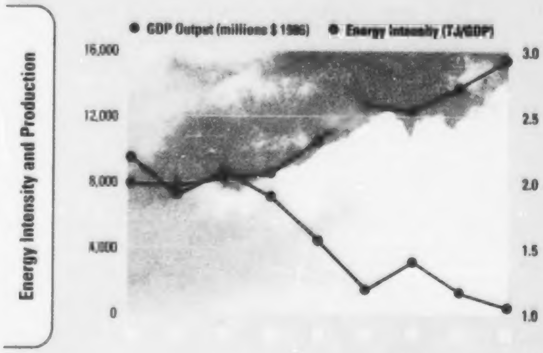
FACTS

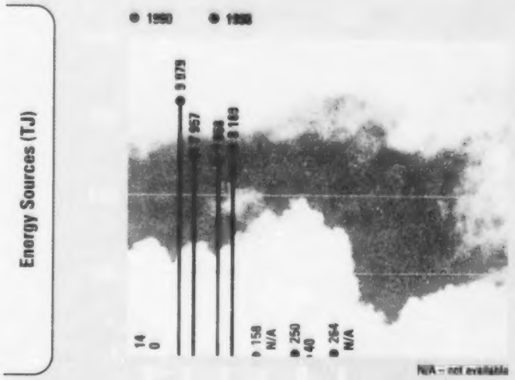
PERFORMANCE HIGHLIGHTS

- The electrical and electronics sector is Canada's least energy-intensive industry.
- Average energy expenditures are less than 1 percent of the value of the industry's shipments, compared with more than 61 percent for materials and supplies, and 16 percent for labour.
- In 1998, total sector shipments reached $15.7 billion, 13.6 percent of the total for all Canadian manufacturing.
- Between 1990 and the end of 1998, the sector's energy consumption decreased by 6 percent despite substantial growth in production.
- Consolidation led the industry to project a decrease of one third in energy consumption over the next decade, ahead of its Kyoto commitments.
- Many sector manufacturers make a significant contribution to decreasing CO_2 emissions by increasing the energy efficiency of the products they manufacture and sell.

FIGURES

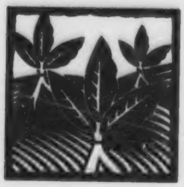






***PROFILE** Canada's fertilizer industry is one of the world's major producers and exporters of nitrogen, potash and sulphur fertilizers, manufacturing 12 percent of the world's total fertilizer output. Companies in this sector operate more than 30 production facilities.*

FERTILIZER



ACTIONS To better measure energy-use patterns and monitor energy efficiency improvements, a fertilizer industry task force is developing baseline information on the sector's energy use. In addition, the Canadian Fertilizer Institute (CFI) and Agriculture and Agri-Food Canada have developed a research program to identify optimal methods of fertilizer use.

Fertilizer manufacturers regard information on their specific activities as confidential. However, the Canadian fertilizer industry is already among the most energy-efficient compared with its global competitors, and economic and environmental factors are leading companies in the sector to continue to develop and employ energy-efficient new technologies. The international focus on climate change provides additional impetus to maximize energy intensity and limit GHG emissions.

ACHIEVEMENTS The fertilizer industry's domestic agriculture sales total more than $2 billion annually, through a network that exceeds 1 500 distributors and retailers across the country. The manufacture, distribution and sales of fertilizer products employ about 12 000 people from coast to coast. Total shipments of approximately 24 million tonnes are valued at about $5.5 billion. More than 75 percent of these shipments are exported, with two thirds of exports to U.S. farmers.

Fertilizer production is energy-intensive, making energy efficiency a key industry priority. Their efforts have made Canadian fertilizer manufacturers acknowledged world leaders in sectoral energy efficiency and emissions control. In fact, its success in reducing energy intensity is a major factor in the industry's ability to remain internationally competitive.

Much of the natural gas consumed by the sector is used as a feedstock to generate hydrogen, an essential ingredient in the production of ammonia. Production efficiency, particularly of nitrogenous fertilizers, has improved over the last 10 years, hence the increase in natural gas consumption owing largely to increased volume of fertilizer produced.

Since 1990, potash production has increased 24 percent for a total of 9.197 million tonnes in 1998. Over the same period, energy consumption by potash producers has risen but the energy component per tonne has declined from 3.92 GJ per tonne in 1990 to 3.72 GJ per tonne of output in 1998. Overall, energy indicators show an improvement in energy intensity that averages more than 1 percent per year since 1990.

According to CIEEDAC, nitrogen fertilizer production increased from 5.44 million tonnes in 1990 to 5.74 million tonnes in 1998, while the CFI database shows production totals of 7.7 million tonnes for 1990 and 11.1 million tonnes for 1998. Similarly, CIEEDAC reports energy consumption of 35 908 TJ in 1990 and 64 326 TJ in 1998, whereas CFI data does not support this magnitude of increase in energy consumption. The CFI believes that there is a strong possibility that current surveys include in the energy consumption data some of the natural gas used as a feedstock in the production of ammonia. The fertilizer industry task force is working to address the issue of data inconsistency.

CHALLENGES Fertilizers play an important role in maintaining and restoring atmospheric health. Just as animals, humans and human technological activities consume oxygen and release CO_2, plants absorb CO_2 and release oxygen. When in harmony, these forces create a stable, but delicate, balance of gases in the atmosphere. By increasing the plant biomass that absorbs CO_2 and produces oxygen, fertilizers help to reinforce the natural balance. Recognizing the important environmental role the industry plays, the CFI has embarked on collaborative research to identify agricultural practices that maximize CO_2 removal from the atmosphere.

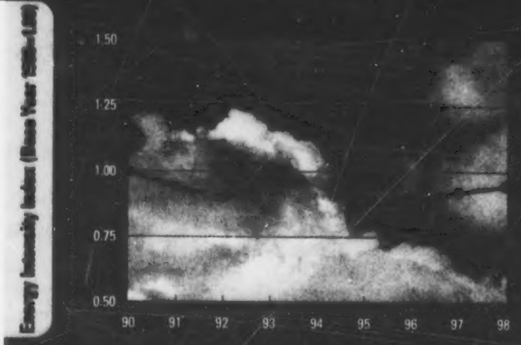
The fertilizer industry faces a significant global challenge. Rapid world population growth combined with limited and diminishing productive crop land is taxing humanity's ability to produce enough food to feed the worldwide population. For the agricultural industry to sustain and boost its production, high-yield practices must be embraced. Consequently, the fertilizer industry must be prepared to make a vital contribution to the sustainability of global food production by focusing on the responsible production and use of fertilizer to nourish the world's soil.

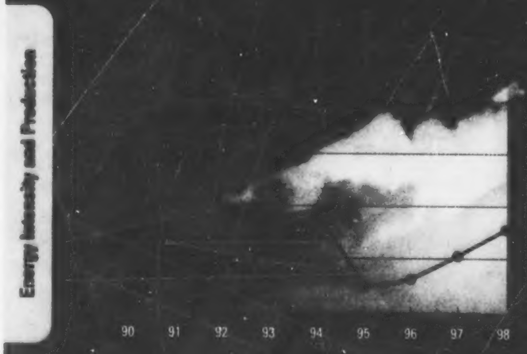
FACTS

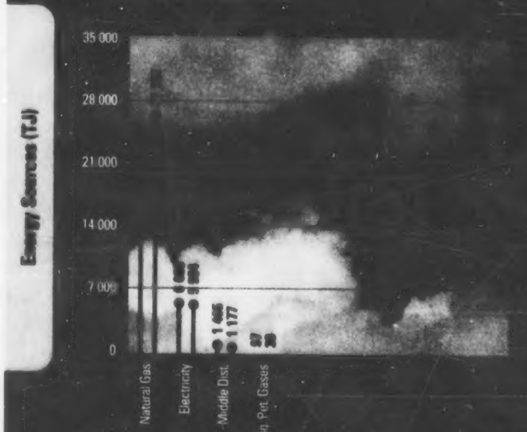
PERFORMANCE HIGHLIGHTS

- Canada's fertilizer industry is one of the world's major producers and exporters of nitrogen, potash and sulphur fertilizers.
- The Canadian industry is among the most energy-efficient compared with its global competitors.
- An industry task force is developing baseline energy consumption information to better measure use patterns and monitor improvements.
- The industry's domestic agriculture sales total more than $2 billion annually, supporting a network of more than 1 500 distributors and retailers across the country.
- Total Canadian shipments are approximately 24 million tonnes, valued at approximately $5.5 billion.
- Nitrogen fertilizer production increased from 5.44 million tonnes in 1990 to 5.74 million tonnes in 1998.

FIGURES







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- The Canadian industry is among the most energy-efficient compared with its global competitors.
- An industry task force is developing baseline energy consumption information to better measure use patterns and monitor improvements.
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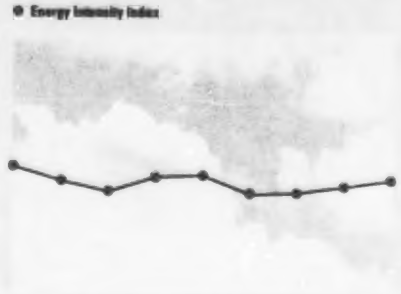
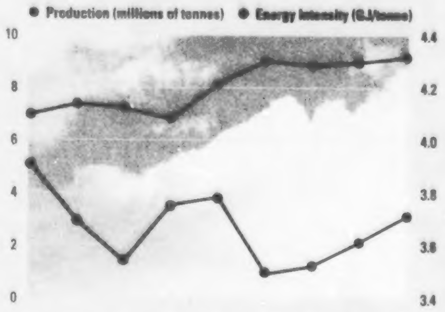
Energy Intensity Index (Base Year 1990=1.00)



Energy Intensity and Production



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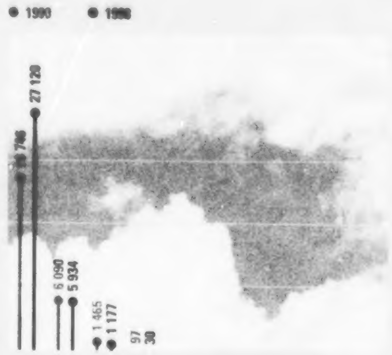


PROFILE *Canada's food processing sector includes manufacturers producing a diverse range of products, including meat, poultry, fruit and vegetables, flour and bakery products, oils and sugars, coffee, snack foods and confections. Sector members operate approximately 3 000 establishments and employ about 200 000 people across the country.*

FOOD PROCESSING

ACTIONS Early in its existence, the Food Processing Task Force set the following goals:

- confirm the quality of baseline data;
- broaden membership in the task force and increase awareness of CIPEC by signing letters of cooperation with key food industry associations;
- hold an energy efficiency seminar tailored to the food processing sector; and
- identify a food processing CEO to act as "champion" for the sector.

In 1999, the task force was able to deliver on three of these four objectives. There is now general satisfaction among task force members concerning the quality of the data collected and reported by Statistics Canada.

The Food and Consumer Products Manufacturers of Canada (FCPMC), an industry association with more than 180 members, and the Canadian Meat Council (CMC), comprising 105 member companies representing the $10.4 billion red-meat industry, have both signed letters of cooperation with CIPEC. Similar agreements are being pursued with other related associations. By formalizing partnerships with industry associations, the task force is not only broadening participation, but it is also able to enhance linkages with related sectors such as dairy, beverages and soft drinks. (Please note that dairy sector data is not included with the food processing sector. For specific details, see the dairy sector report.)

Monitoring and Tracking Workshops customized for the food processing industry and co-marketed by the FCPMC were held on February 9 and 10, 2000. The workshop furthers the work of the task force in bringing practical energy-management tools to sector members and addressing the challenges of consistent data tracking within the industry.

The task force is still attempting to identify an industry champion who will, among other things, raise energy efficiency awareness among food processing company executives.

In addition to industry-wide energy efficiency activities, individual members continue to invest in energy efficiency. Many companies have introduced energy-efficient boiler technologies, drying technologies, and monitoring and tracking systems. For example, Industrial Energy Innovator Maple Leaf Pork is in the process of replacing steam heat exchangers with a direct contact hot water heater. The company anticipates a minimum 25-percent reduction in fuel use per litre of water heated. Maple Leaf Pork will realize additional savings by insulating new hot water piping and the company is exploring opportunities to reduce natural gas consumption by recovering waste heat from its singers.

Nestlé Canada has introduced a comprehensive energy and environmental monitoring and targeting system. Improved tracking is helping Nestlé to identify and reduce inefficiencies, adopt best practices and uncover new savings opportunities.

Industrial Energy Innovator Maple Leaf Consumer Foods has taken action to build energy cost savings at its Winnipeg ham processing plant. Repairs to some of its power factor capacitors have enabled the plant to raise the power factor level to the 0.89–0.91 range from 0.81–0.85 before the repairs. This change has resulted in savings of $35,000 annually. The company plans to bring its power factor level up to 0.98 or 0.99 in the coming year, netting a further annual energy cost saving of $25,000.

Maple Leaf Consumer Foods has also installed a blow-down heat-recovery system and a vent condensing system from the condensate tank to recover heat, water and chemicals from the boiler continuous blow down, and return them to the steam system. This system reduces the amount of makeup water required by the boilers. The vent condensing system will save approximately $6,570 in annual energy costs with a payback of less than 120 days.

Other companies in the sector have installed energy-efficient air pressure blanket doors and air reclaimers, and have modernized equipment and facilities to help improve energy efficiency. Many food processors are moving from carbon-intensive fuels, such as oil, to natural gas.

ACHIEVEMENTS Essential baking, processing, cooling and ventilating activities make food processing an energy-intensive industry. However, energy efficiency efforts within the sector have helped to control and even reduce energy consumption. The sector's energy consumption approached 95 081 TJ in 1998, up from 85 608 TJ in 1990. Since 1990, use of electricity and steam in the food processing sector has increased, while use of heavy fuel oil has declined. In general, the industry recorded an energy-intensity improvement in 1998 of approximately 8 percent compared with 1990.

The food processing sector continues to operate under the CIPEC umbrella and to abide by industrial targets set for the sector. Data collected under CIPEC has been forwarded to Agriculture and Agri-Food Canada to support its National Climate Change Issue Table efforts, and a position paper on the agriculture and agri-food industry has been completed. Moreover, the addition of the FCPMC and the CMC to the Food Processing Task Force will increase the profile of energy efficiency initiatives and the CIPEC program among food processing companies.

CHALLENGES The complexity and diversity of the food processing industry make it difficult to find a workable definition for the sector and to establish a single, comprehensive energy efficiency target. In general, targets set by individual sector members are in the order of 1 percent per year or more. However, developing meaningful energy consumption data will require a review and modification of the narrow boundaries established by the Standard Industrial Classification code.

To begin developing more meaningful targets, the Food Processing Task Force polled its members for their energy efficiency goals. In addition, the FCPMC will poll its members to see if their targets vary significantly from those of the task force.

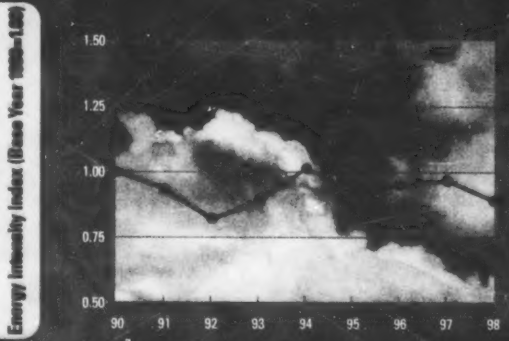
The erosion of the competitive advantage of lower energy costs historically enjoyed by the industry has boosted the urgency for sector members to capitalize on energy efficiency. Rising prices of energy sources are challenging the industry to find new ways to reduce what is a significant component of food product costs.

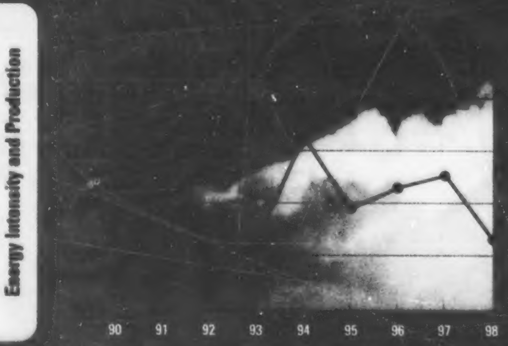
FACTS

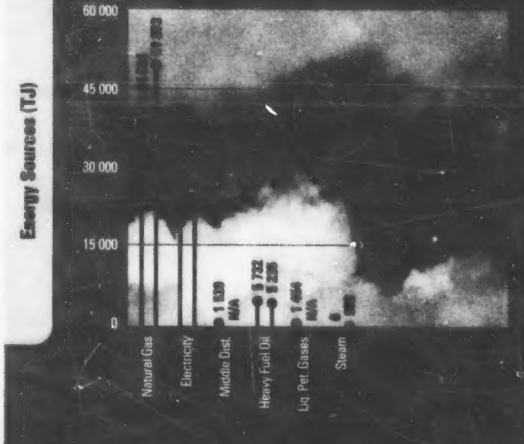
PERFORMANCE HIGHLIGHTS

- **Food processing sector members operate approximately 3 000 establishments and employ about 200 000 people across the country.**
- **In 1999, FCPMC and the CMC both signed letters of cooperation with CIPEC.**
- **Monitoring and Tracking Workshops customized for the food processing industry were held on February 9 and 10, 2000.**
- **A new direct contact water heater at Maple Leaf Pork will reduce fuel use per litre of water heated by a minimum of 25 percent.**
- **Nestlé Canada introduced a comprehensive energy and environmental monitoring and targeting system.**
- **Maple Leaf Consumer Foods plans investments to bring its power factor level up to 0.98 or 0.99.**
- **The industry recorded an energy-intensity improvement in 1998 of approximately 8 percent compared with 1990.**

FIGURES







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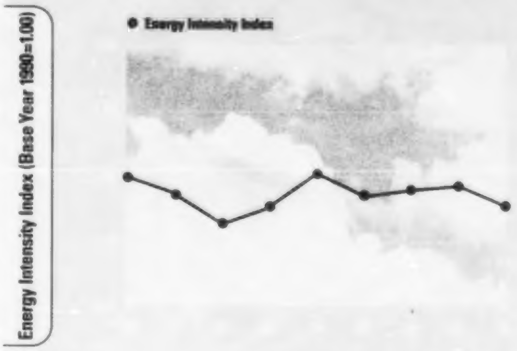
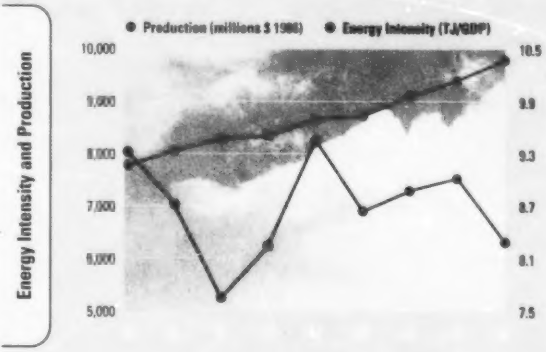
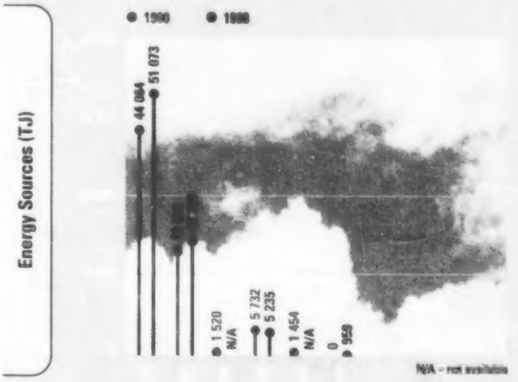
FIGURES







N/A – not available

PROFILE ***Ninety percent of all manufactured goods depend either directly or indirectly on the castings produced by Canada's foundry industry. There are approximately 200 foundries in Canada, employing 15 000 people and generating annual sales of $1.5 billion. About two thirds of the foundry sector's production is exported.***

| FOUNDRY |

ACTIONS Canada's foundries have maintained a focus on upgrading operations with energy-efficient technology as in the following examples.

- ESCO Limited has introduced a number of energy efficiency measures at its Port Coquitlam, B.C., facility. To conserve electricity, the company installed energy-efficient lighting in a number of buildings and reduced the maximum melt temperature in its furnace. To reduce natural gas consumption, ESCO eliminated its core furnace and ladle refractory lining bricks with boards. Ladles no longer need to be heated before first use and can be maintained at a much lower temperature between uses.
- Lethbridge Iron Works Company Limited has introduced a wide range of programs to improve energy efficiency. The company has installed modern, efficient, coreless induction furnaces to replace its old indirect electric arc furnaces, and has also added a new, high-efficiency heat-treatment furnace that uses modern insulation materials to conserve energy. Additional power has been saved by installing compact fluorescent lighting throughout the facility, computerized programmable logic controllers on nearly all processing equipment, and an automatic damper on compressors to turn process heat into space heat. Many space heaters have been modernized, the return sand transport system upgraded, and motors at the end of their life cycle replaced with high-efficiency models.
- Bibby-Ste-Croix has replaced two 4.7-GJ burners in its Ste-Croix, Quebec, foundry with a new three-burner system. The company modified burner placement for the new 3-GJ units to improve furnace heat distribution and achieve a substantial reduction in natural gas consumption. Installation of a casting sand-cooling drum, which enables consistent sand temperatures, lowered rejection rates while saving the company more than $250,000 per year in energy costs.

At the sector level, CIPEC is leading the development of an energy-management program for the Canadian Foundry Association. CIPEC is developing the program with the involvement of Canada Centre for Mineral and Energy Technology and the foundry industry, a positive step toward expanding the industry's involvement in CIPEC.

ACHIEVEMENTS For companies within the sector, environmental and bottom line concerns are motivating most of Canada's foundries to seek ways to improve energy efficiency and reduce GHG emissions. For example, many firms no longer use GHG-generating fuels such as coal, oil or coke in their operations and have eliminated the use of steam produced by coal-generated electricity. And many foundries are making a commitment to energy efficiency and signing up as Industrial Energy Innovators.

Both environmental and cost concerns are leading a growing number of companies to fuel switching programs and to the introduction of more energy-efficient equipment and methods. Thanks to the commitment of its members, the foundry sector plans to continue to record year-over-year improvements in its energy efficiency performance.

CHALLENGES Canada's foundries are engaged in an endless search for more energy-efficient equipment and methods driven by the continual need to remain cost and price competitive while meeting environmental standards. Recognizing that their best interests lie in meeting all applicable environmental standards as well as reducing the energy component in their products, most foundries are closely monitoring energy consumption and implementing programs to improve energy efficiency.

FACTS

FIGURES

PERFORMANCE HIGHLIGHTS

- Canada's 200 foundries employ 15 000 people and generate annual sales of $1.5 billion.
- ESCO Limited installed energy-efficient lighting in a number of buildings and reduced the maximum melt temperature in its furnace.
- Lethbridge Iron Works installed modern, efficient, coreless induction furnaces to replace its old indirect electric arc furnaces and added a new, high-efficiency heat-treatment furnace.
- Bibby-Ste-Croix replaced two 4.7-GJ burners in its Ste-Croix foundry with a new energy-saving three-burner system.
- Environmental and cost concerns are leading companies to fuel switching and to the introduction of more energy-efficient equipment and methods.

FIGURES

The sector is currently working with CIEEDAC and the OEE to develop indices and figures.

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- Environmental and cost concerns are leading companies to fuel switching and to the introduction of more energy-efficient equipment and methods.

***PROFILE** The general manufacturing sector comprises a variety of industries, including leather, clothing, furniture, printing, machinery, construction materials, floor coverings, imaging products, insulation, adhesives and pharmaceuticals. The sector encompasses approximately 2 000 small, medium-sized and large companies that, combined, consumed about 186 486 TJ of energy, or about 8.5 percent of the total energy consumed by all CIPEC sectors in 1998.*

GENERAL MANUFACTURING

ACTIONS To establish the fullest possible representation of the general manufacturing sector, supplementary task forces were formed in Alberta and Quebec in 1998. In addition to the national task force and these new western and eastern regional task forces, participation by related business associations and utilities has broadened the reach of energy efficiency initiatives in this eclectic sector.

Throughout 1998 and 1999, the national task force held regular quarterly meetings focused on broadening participation in CIPEC, establishing meaningful energy efficiency improvement targets, and identifying sector-specific issues, opportunities and achievements. Since the western and eastern task forces became active, they have been making significant contributions to the attainment of national representation and increased company involvement.

Other industry groups have also joined in the sector's efforts. Early in 1999, CIPEC obtained the formal support of the Canadian Association of Man Made Vitreous Fibre Manufacturers (CAMMVFM). Several companies that are active task force contributors are included in its membership. Moreover, the addition of prominent business organizations such as the Canadian Chamber of Commerce and Enbridge Consumers Gas has increased awareness of the sector's energy efficiency programs.

Aside from their collective achievements, individual task force members continue to demonstrate leadership within their own facilities and beyond. For example, through a unique partnership with a local high school, founding member Owens-Corning Canada Inc. provides ongoing support for an annual energy program at the school. Students create unique, energy-related projects, for which Owens-Corning provides recognition and prizes. Winning projects are put on display in the lobby of Owens-Corning's Scarborough, Ontario, facility.

EMCO Limited, an active participant in all three general manufacturing task forces, has undertaken several actions to reduce GHG emissions, including improvements to steam distribution, piping insulation, combustion, heat recovery, water use and compressed air distribution.

Industrial Energy Innovator and task force participant Kodak Canada Inc. has reported a steady decrease in consumption of electrical energy since 1990. In addition, the company has achieved a 13 percent reduction in total CO_2 equivalent emissions since 1990, and a 30 percent reduction of CO_2 per unit of production. Kodak will continue to track its progress through the objectives and targets it established under its recent ISO 14001 registration.

ACHIEVEMENTS In 1999, the General Manufacturing Task Force approved a 1999–2000 action plan that includes key objectives, as follows:

- achieve an energy efficiency improvement target of 1 percent per annum to the year 2010;
- increase Industrial Energy Innovator enrollment;
- broaden task force representation by establishing regional task force divisions for western and eastern Canada;
- distribute letters of support for CIPEC and Industrial Energy Innovators;
- maintain ongoing collaborative efforts with organizations including the CAMMVFM, the Canadian Chamber of Commerce, the Alliance of Manufacturers & Exporters Canada and Enbridge Consumers Gas;
- increase the involvement of other associations and firms;
- encourage energy efficiency progress reporting by the sector's Industrial Energy Innovators;
- draw attention to the success of general manufacturing companies by encouraging firms to submit success stories and case studies to CIPEC; and
- share industry ideas and information on energy efficiency opportunities and strategies.

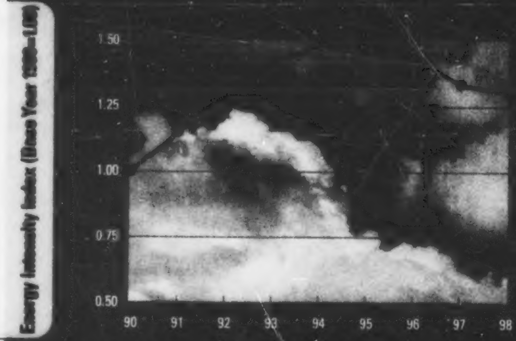
In addition, the sector continues to focus on building increased awareness of energy efficiency issues within the industries it encompasses and is encouraging continued education among company employees and family members.

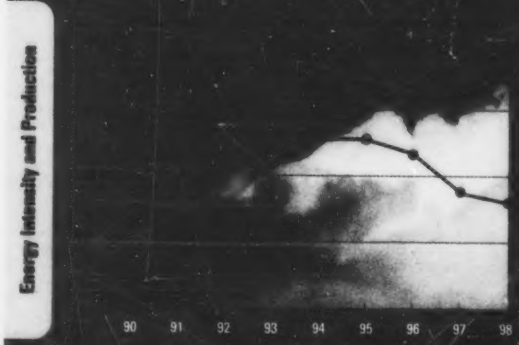
CHALLENGES Manufacturers and exporters within the industries under the general manufacturing umbrella face significant international competition. These companies must balance the time, cost and efforts needed to improve energy efficiency and meet environmental standards with the necessity to compete with countries not bound by the same constraints. Moreover, for many companies, the relatively low cost of energy reduces the economic effectiveness of major capital expenditures to improve energy efficiency.

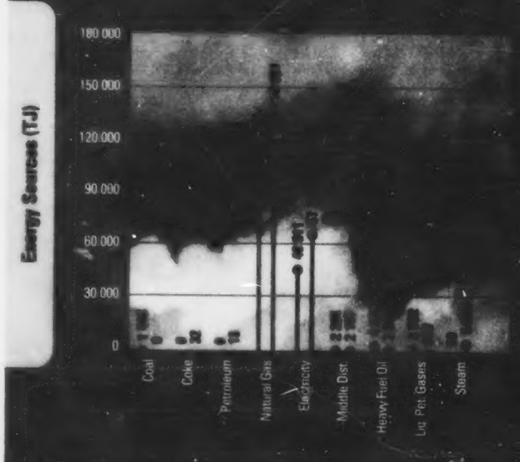
The sector's unusual diversity also presents a challenge, making it difficult for a single task force to advance the interests of all the companies it represents. Furthermore, many manufacturers, especially smaller ones, lack the knowledge and financial resources to identify and act on energy-saving opportunities. Despite the recognized importance of improving energy intensity, lack of staff and capital resources to dedicate to energy projects can be a significant impediment.

Compounding difficulties for the sector is the lack of meaningful baseline energy data. The General Manufacturing Task Force was launched in 1998 following the disbanding of a predecessor group. Because the sector's composition has changed, data used in the CIPEC annual reports before 1995/1996 is no longer applicable and cannot be compared with data in this report.

FIGURES







FACTS

PERFORMANCE HIGHLIGHTS

- **The approximately 2 000 companies included in the general manufacturing category consumed about 186 486 TJ of energy in 1998.**
- **To establish full national representation for the sector, supplementary task forces were created in Alberta and Quebec to cover the western and eastern regions.**
- **CIPEC obtained the formal support of the CAMMVFM.**
- **Owens Corning continues to support an annual energy program at a local school.**
- **EMCO Limited has made improvements to steam distribution, piping insulation, combustion, heat recovery, water use and compressed air distribution to conserve energy.**
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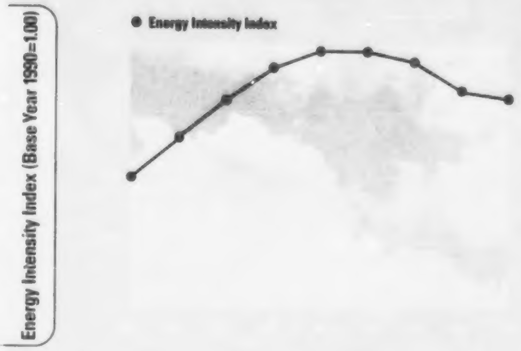
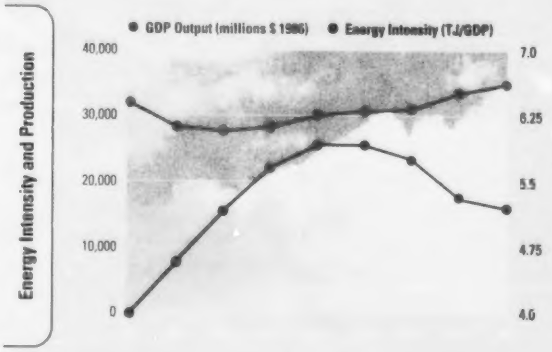
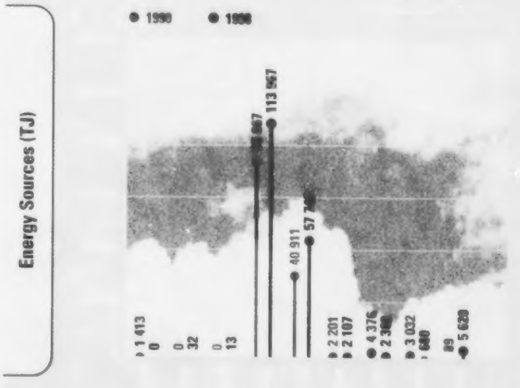
FIGURES







***PROFILE** Canada's merchant lime sector supplies essential raw materials for steel production, mining, pulp and paper manufacturing, water treatment, environmental management and other basic industries. Operating 16 facilities, the sector's seven companies employed more than 650 people and had a combined lime calcining capacity of 2.28 million tonnes in 1998. From 1990 to 1997, the sector increased lime production by 25 percent, while production fell slightly by 1.3 percent from 1997 to 1998.*

LIME

ACTIONS The Canadian Lime Institute (CLI) continued to promote energy efficiency, holding its second Energy Efficiency Workshop in November 1999 to help members improve energy use in their operations. The CLI, with NRCan, published an energy conservation and efficiency guide specific to the lime sector. This publication provides general guidelines for companies seeking to use various technologies and other measures to reduce energy consumption.

Within individual companies, energy efficiency improvements have included the application of preheater technology, process automation and increased mining efficiency.

For example, Ingersoll Lime Limited recently upgraded capacitors, improving its power factor and reducing electricity use, in its Ingersoll, Ontario, facility.

Continental Lime Ltd. upgraded the crusher feeder at its Exshaw, Alberta, facility to accommodate larger haul trucks, reducing haul fuel consumption by about 40 percent. The Exshaw facility also continued to refine kiln-operating practices and installed new refractory technology to reduce energy intensity.

ACHIEVEMENTS Companies represented by the CLI are actively working to improve the energy intensity of their products. Since the 1970s the merchant lime sector has decreased its energy intensity by an estimated 29 percent. While total energy consumption increased by 635 TJ between 1990 and 1998 (as production increased by 23 percent), energy intensity decreased by 15.5 percent. In 1998, energy intensity decreased 4.2 percent from 1997 levels. The sector's energy intensity target is continuing to improve at a rate of 0.3 to 0.5 percent per year through to 2001.

GHG emissions resulting from the production of lime are offset to some extent by the reabsorption of CO_2 by lime during its life cycle. The National Lime Association estimates that more than 25 percent of lime produced in Canada and the United States reabsorbs CO_2 either in process or naturally.

CHALLENGES The production of lime occurs at very high temperatures (in excess of 1200°C), requiring combustion fuels as the principal energy source. Natural gas is the principal fuel source, with petroleum, coke and coal making up most of the balance.

The industry's heavy dependence on fuel makes energy efficiency both a top priority and major challenge. While incremental improvements continue to be made to existing manufacturing equipment, large-scale gains require substantial capital investments in new, more efficient kiln installations. However, capital turnover rates within the industry dictate the ability of lime manufacturers to make such investments.

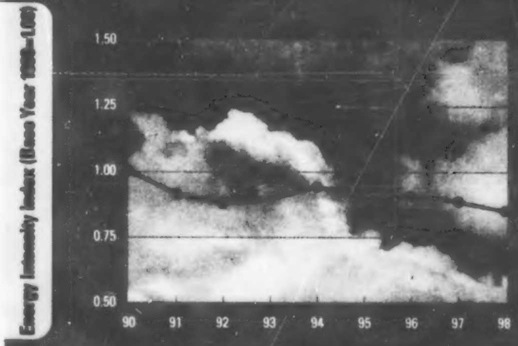
Moreover, the energy-intensity advantages of fuel switching and high-efficiency large kiln technology are undercut by the fact that these strategies may interfere with product quality, a result of paramount consideration for some of the sector's largest customers.

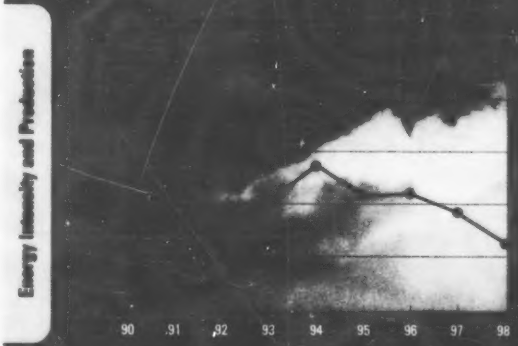
FACTS

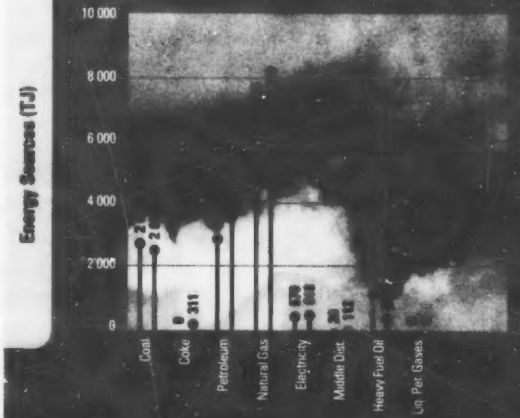
PERFORMANCE HIGHLIGHTS

- From 1990 to 1998, the lime sector increased production by 23 percent.
- CLI held its second Energy Efficiency Workshop in November 1999 to help members improve energy use in their operations.
- The CLI and NRCan published an energy conservation and efficiency guide specific to the lime sector.
- Ingersoll Lime recently upgraded capacitors to improve its power factor and reduce electricity use.
- Continental Lime upgraded its crusher feeder to accommodate larger haul trucks and reduce haul fuel consumption by about 40 percent.
- While total energy consumption increased by 635 TJ between 1990 and 1998, energy intensity decreased by 15.5 percent.
- Havelock Lime reduced fuel consumption in its shaft kiln and improved gradation.
- Companies representing 98 percent of lime production in Canada are participants in the VCR Inc.
- Chemical Lime recovered hot air from lime cooling for fuel combustion in the kiln.

FIGURES







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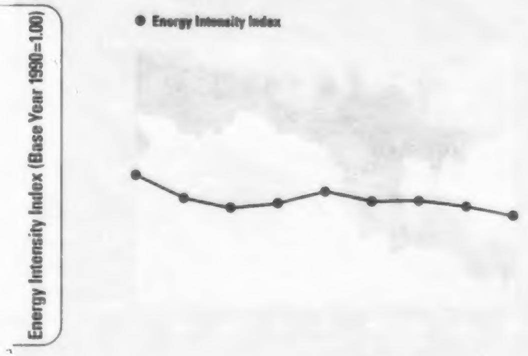
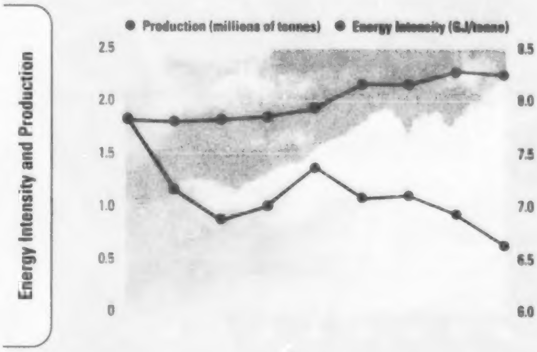
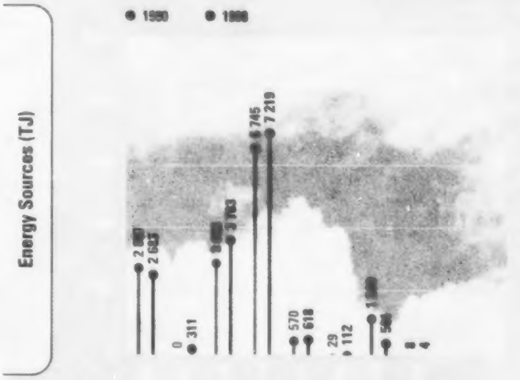
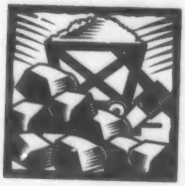






PROFILE *Canada has a well-established mining industry, directly employing 367 000 people, with an annual payroll of $4.4 billion in its mining, smelting and refining activities. In 1998, the sector's output was valued at $27 billion or 4 percent of the nation's GDP. The Canadian mining sector exports roughly 80 percent of its production, valued at $45 billion or 14 percent of total domestic exports. Canada's mineral and metal exports increased by 56 percent between 1993 and 1998.*

MINING



ACTIONS Members of the Mining Association of Canada (MAC) continue to improve energy efficiency, reduce production costs and contribute to Canada's overall global competitiveness.

For example, in 1998, Cominco Ltd.'s Trail, B.C., operations achieved a total GHG emission reduction of 40 percent compared with 1990. Over the same period, carbon energy consumed per tonne of metal was cut by 26 percent and CO_2 produced per tonne of metal dropped by 33 percent.

At Teck Corporation's Canadian operations, recent energy management performance improvements in materials transportation, process applications, and heating and ventilation will enable the company to stabilize emissions at 1990 levels by 2000. Teck forecasts that its total GHG emissions will decrease 8 percent below the 1990 baseline by 2000, an improvement of 21 percent despite a projected increase of 16 percent in the volume of material mined.

The Sudbury division of Falconbridge Limited completed 14 energy efficiency projects in 1998, including system and process technology modifications, and changes to operating practices. The reduction in annual energy consumption of 9 GWh represented a reduction in GHG emissions of 1.7 kilotonnes and yielded $495,000 in energy cost savings. Falconbridge's Mine Ventilation Automation Project, completed in 1999, puts in place sophisticated underground communications and control technologies. The first two phases of the project have reduced energy consumption by 25 GWh, yielding a reduction in indirect GHG emissions of 4.7 kilotonnes and producing annual savings of $1.4 million.

In addition to the actions of individual members, MAC is actively engaged in the VCR Inc., the national Office of Energy Efficiency advisory board, and several Climate Change Issue Tables. Moreover, the MAC energy task force is the first industrial sector to launch an energy managers' Internet chatline to facilitate the sharing of information and best practices, and to provide assistance in solving energy problems.

In December 1999, 13 of 30 MAC members, representing the majority of energy demand related to metal mining and non-ferrous smelting and refining, had submitted action plans to the VCR Inc. Ten members have subsequently submitted progress reports.

Also in 1999, MAC contracted two recognized environmental consultants, the Pembina Institute and Resource Futures International, to provide guidance on developing corporate strategies and action plans to help members to meet the challenges of reducing GHG emissions while also building international competitiveness.

In 2000, MAC members will host workshops on the range of options and actions to be considered for inclusion in an effective corporate climate change strategy.

ACHIEVEMENTS The metal mining industry's energy mix is heavily weighted toward electricity (43 percent), followed by heavy fuel oil and middle distillates. In 1998, total energy use in the metal mining sector was 87 965 TJ, or 3.2 percent of total Canadian industrial energy consumption. Compared with 1990, metal mining energy use was 13.3 percent lower in 1998. Total CO_2 emissions (direct and indirect) dropped 4.2 percent in 1998 compared with 1990.

In contrast, the non-metal mining industry's energy mix is heavily weighted toward natural gas (68 percent), followed by electricity (17 percent) and middle distillates (11 percent). In 1998, total energy use in the non-metal mining sector was 46 186 TJ or 1.7 percent of total Canadian industrial energy consumption. Compared with 1990, non-metal mining energy use was 10 percent higher in 1998. Total CO_2 emissions increased by 2.5 percent in 1998 compared with 1990.

The non-ferrous metal smelting and refining industry (excluding aluminum and magnesium) has an energy mix weighted toward electricity (48 percent) followed by natural gas (23 percent) and coal (14 percent). In 1998, total energy use in the non-ferrous metal smelting and refining sector was 78 284 TJ or 3.0 percent of total Canadian industrial energy consumption. Compared with 1990, the industry's energy use was 4.2 percent lower in 1998. Total CO_2 emissions dropped 8.5 percent in 1998 compared with 1990.

MAC members recognize that a credible response to climate change requires industry action and leadership. That is why MAC and its members are heavily involved in government initiatives aimed at actions and innovations that improve energy intensity and reduce GHG emissions.

CHALLENGES A combination of fluctuating international metal prices, increased competition and rapid technological change continue to put pressures on the mining sector's capital investment programs. However, the Canadian mining industry is an economic and technological leader, investing billions of dollars in capital projects and leading Canadian industry in productivity growth.

Despite improvements in energy use per unit of output and in emissions records throughout the 1990s, the mining sector will be challenged as the industry expands and energy requirements grow. And as the industry uses more energy, its GHG emissions are also projected to grow.

Energy represents between 10 and 25 percent of production costs, making energy efficiency an important part of the industry's overall competitiveness strategy. Thus, it is imperative for MAC to continue to bolster the industry's energy efficiency efforts. Members believe that, despite global economic challenges, the mining sector will continue to make substantial energy efficiency gains.

FACTS

PERFORMANCE HIGHLIGHTS

- **In 1998, mining sector produced an estimated $27 billion in output, or 4 percent of Canada's GDP.**
- **Cominco's Trail operations reduced total GHG emissions by 40 percent between 1990 and 1998.**
- **Teck Corporation's recent energy performance improvements will enable the company to stabilize emissions at 1990 levels by 2000.**
- **The Sudbury division of Falconbridge completed 14 energy efficiency projects in 1998.**
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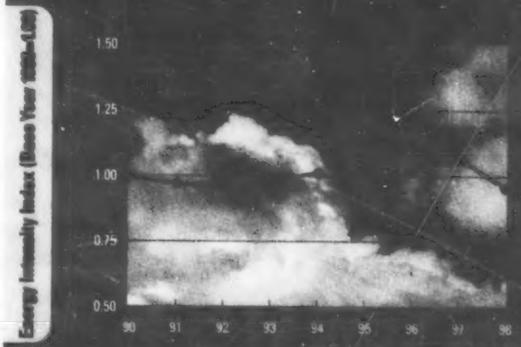

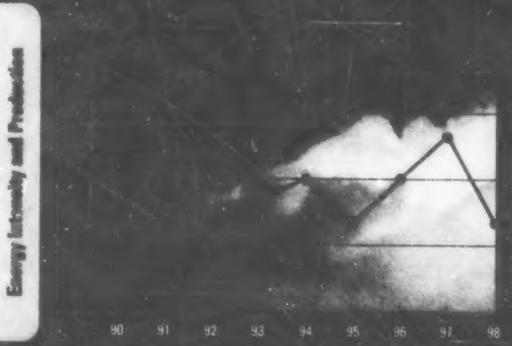

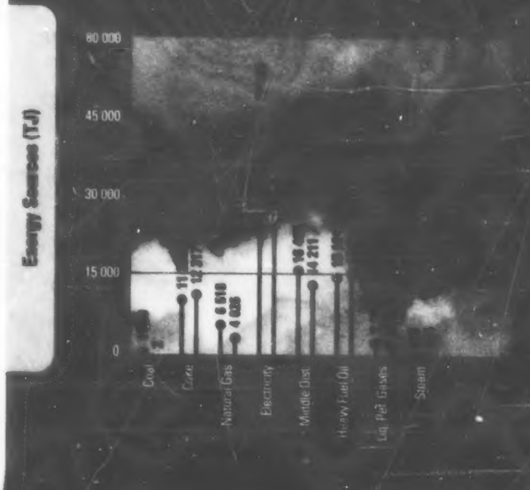

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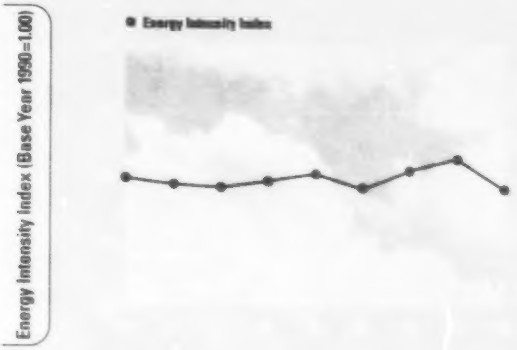

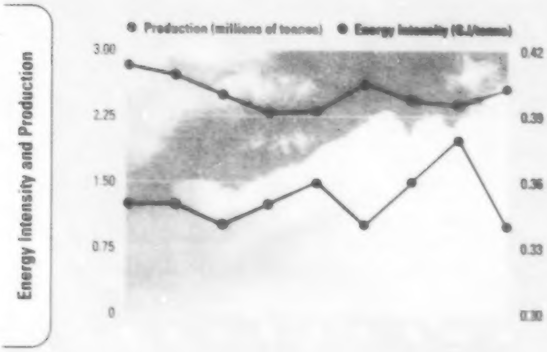

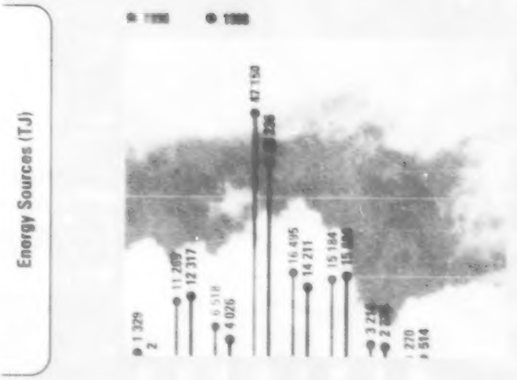

***PROFILE** Canada's oil sands sector includes two plants in northern Alberta and one heavy oil upgrader in Saskatchewan. Together, these facilities produce more than 350 000 barrels per day of synthetic crude oil for markets in Canada and the United States. The sector is a major employer and a significant contributor to Canada's GDP.*

OIL SANDS

ACTIONS The oil sands sector is committed to ongoing improvements in its energy efficiency and intensity through a combination of operational excellence and technological innovation. Plants are improving the reliability of their operations and introducing programs to recover waste heat and improve yields through more efficient processing. Other gains have come from the introduction of new technologies in the mining and extraction stages.

In the example of extraction plant tumblers, which use live steam to separate oil from sand, careful control of process conditions has reduced steam usage by an amount equivalent to 40 000 tonnes of CO_2 emissions per year.

New equipment has been installed to recover hydrogen from the hydrotreater purge gas streams, thereby decreasing the need for additional hydrogen production and reducing CO_2 emissions by an estimated 40 000 tonnes per year.

In 2000, a third steam turbo generator will be added to recover energy currently lost through the reduction of steam pressure through letdown valves. By using waste steam to generate electricity, power import requirements will be reduced.

An automated energy-management control system is in the design stage and will be installed in 2000. This software will be used to optimize the production of steam and power in the existing utility plant, thus minimizing energy requirements and associated costs.

Research and development, capital investment, managerial leadership and employee commitment are keys to the industry's track record of success and building blocks for future improvements.

ACHIEVEMENTS In 1998, the oil sands sector continued to improve its energy efficiency. Energy consumed per unit of production fell to 8.34 GJ/m^3, a 5.7-percent improvement compared with 1997. This compares favourably with the sector's target of a 1 percent minimum average improvement in energy efficiency per unit of production.

While total annual production rose 73 percent since 1990, energy use rose only 31.7 percent. In 1998, energy consumption totalled 172 381 TJ, 15 486 TJ below 1995 levels. Energy intensity showed a total improvement of 24 percent since 1990.

Oil sands industry members are reducing the use of coke by switching to natural gas, resulting in a significant reduction in GHG emissions.

CHALLENGES Combining innovative technologies with operational excellence is key to reducing the energy consumed in oil sands production. Extraction methods that are better and less energy-intensive must be implemented and material-handling systems must be modified to more efficiently accommodate increasing production loads. However, developing and implementing improved processes, equipment and procedures is both time-consuming and expensive. The long lead times and substantial investments required to introduce enhancements have affected progress toward greater energy efficiency.

M121

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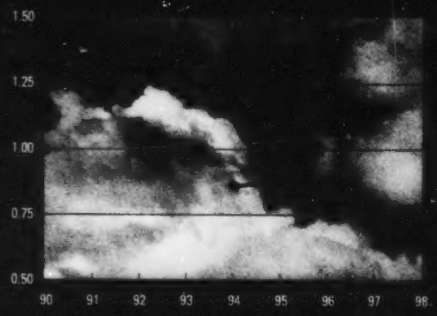
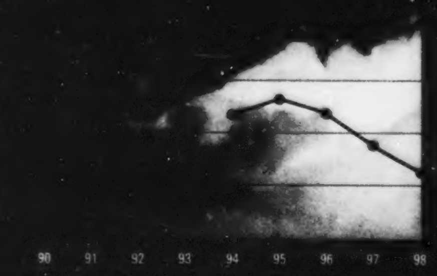
- An automated energy-management control system is in the design stage and will be installed in 2000.
- In 1998, energy consumed per unit of production fell to 8.34 GJ/m^3, a 5.7-percent improvement over 1997 and a total improvement of 24 percent since 1990.

FIGURES

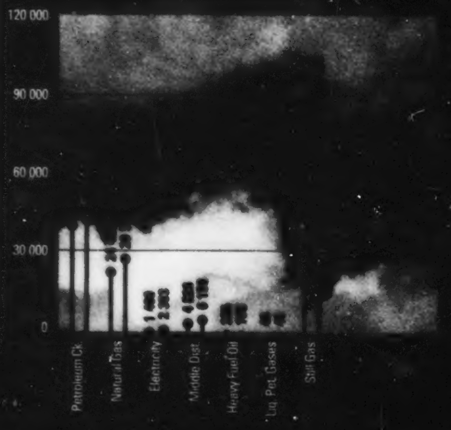
Energy Intensity Index (Base Year 1990=1.00)



Energy Intensity and Production



Energy Sources (TJ)



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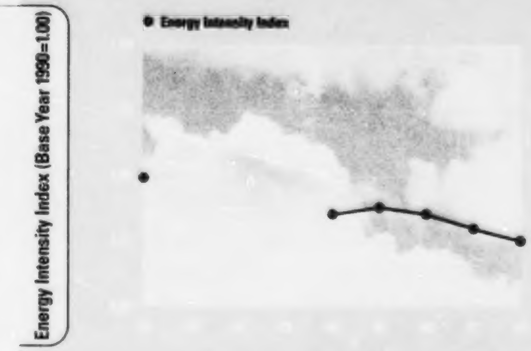

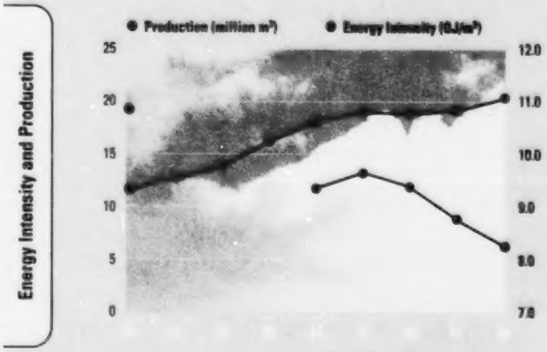

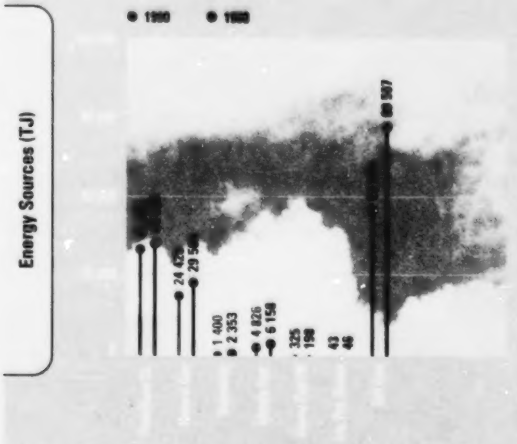

***PROFILE** Canada's petroleum products sector markets gasoline, diesel, heating oil, jet fuels, lubricating oil, grease, food-grade white oils, asphalts and aromatic hydrocarbons through a network of more than 15 000 wholesale and retail outlets nationwide. Operating 21 oil refineries across the country, the industry provides direct employment for 100 000 Canadians and generates an additional 250 000 indirect jobs.*

| PETROLEUM PRODUCTS |

ACTIONS A number of refineries invested substantial capital in improvements that enhance energy efficiency.

- Petro-Canada installed an enhanced heat-recovery system on a crude unit at one of its refineries, a move that will recover waste energy and reduce fuel use in its feed furnaces. The project, which cost $750,000, will save about 218 TJ per year in energy, reduce CO_2 emissions by 11 000 tonnes per year and net about $250,000 in savings each year.
- Imperial Oil Limited initiated a number of upgrades at its facilities, including improving the efficiency of its steam and hot water systems, installing new vacuum pumps, upgrading combustion analysers on process furnaces, and improving compressor and heat exchanger performance. Combined, these improvements have reduced the company's CO_2 emissions by more than 48 000 tonnes per year.
- Shell Canada Limited continued its focus on energy efficiency with a number of process and operational improvements, including the realignment of heat-exchanger trains, improvements to insulation and the installation of variable speed drives on air coolers. In total, the company's downstream operations realized a 70 000-tonne reduction in CO_2 emissions in 1998 and a 1.7 percent improvement in energy intensity. Combined with upstream improvements, Shell reduced its company-wide CO_2 emissions by 335 000 tonnes per year in 1998 and reached its target for 2000 two years early.
- Chevron Canada Limited installed a new waste-heat boiler and pump-around heat exchanger at its Vancouver, B.C., refinery in the last half of 1998, bringing the boiler fully online in the early part of 1999. An investment of $9 million has reduced energy consumption by close to 400 TJ per year, about 25 percent more than targeted. The project has led to an annual reduction in CO_2 emissions of approximately 20 000 tonnes and annual energy savings in purchased natural gas of about $1 million. Although capital budgets have been reduced significantly from prior years, Chevron will continue to focus on energy efficiency into 2000, including plant optimization, development of additional energy-intensity monitoring tools, furnace tuning and steam trap maintenance. Selective "debottlenecking" of crude unit heat exchangers will also be targeted through focused capital spending.

ACHIEVEMENTS Production of petroleum products grew in 1998 while the industry's energy intensity decreased. In 1998, the sector increased its production by 0.6 percent over the previous year while decreasing its energy intensity by 1.4 percent to 2.43 GJ/m^3. Compared with the 1990 base year, the sector's total energy consumption has decreased by 6.5 percent to 247 981 TJ. Between 1997 and 1998, energy consumption decreased by approximately 2000 TJ, or 0.8 percent. In 1998, the sector's energy intensity index stood at 93.3, a 1.3 percent improvement since 1997 and 17 percent better than 1990, exceeding the industry's commitment of 1 percent per year improvement.

CHALLENGES While the industry has exceeded its commitment of 1 percent annual improvement in energy intensity, pressures for increased production, driven by population and economic growth, will make ongoing improvements more challenging. Fortunately, higher capacity utilization improves refinery efficiency, thereby lowering the energy required per unit of output. In 1998, capacity utilization was 89.5 percent, compared with 89 percent in 1997.

The industry also faces increasing pressure to reduce the sulphur levels in gasoline and diesel fuels. Meeting increasingly stringent sulphur content standards requires refineries to employ more energy-intensive methods, processes that make it more difficult and expensive to reduce CO_2 emissions. Energy efficiency will be further impaired by the introduction in 1999 of lower benzene content standards for gasoline.

Economic circumstances and regional price wars for retail gasoline have drastically reduced capital budgets for refining. Thus, a new challenge lies in chasing energy efficiency in an environment where capital spending cannot be relied on.

FACTS

PERFORMANCE HIGHLIGHTS

- The industry operates 21 oil refineries across the country and provides 100 000 direct jobs.
- Petro-Canada installed an enhanced heat-recovery system that will save about 218 TJ per year in energy, reduce CO_2 emissions by 11 000 tonnes per year and net about $250,000 in annual savings.
- Imperial Oil upgraded its facilities to reduce the company's CO_2 emissions by more than 48 000 tonnes per year.
- Shell Canada reduced its company-wide CO_2 emissions by 335 000 tonnes per year in 1998 and reached its target for 2000 two years early.
- Chevron's $9-million investment reduced energy consumption by close to 400 TJ per year, resulting in an annual reduction in CO_2 emissions of approximately 20 000 tonnes and annual energy savings worth about $1 million.
- In 1998, the sector's energy intensity index stood at 93.3, a 1.3-percent improvement since 1997 and 17 percent better than in 1990.

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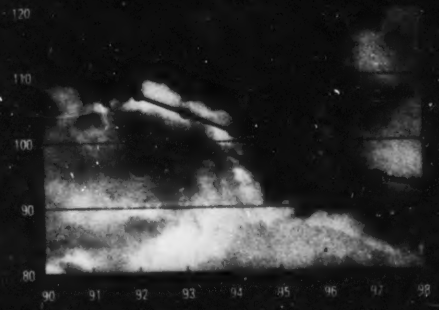
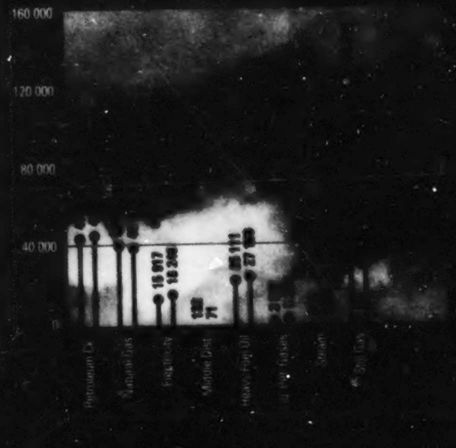
Energy Intensity Index



Energy Intensity and Production

Energy Sources (TJ)



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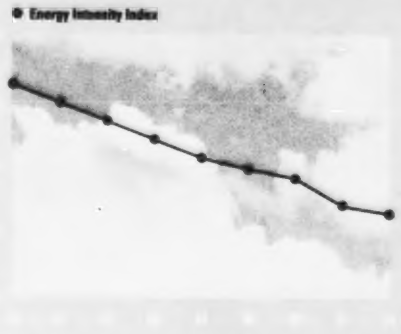
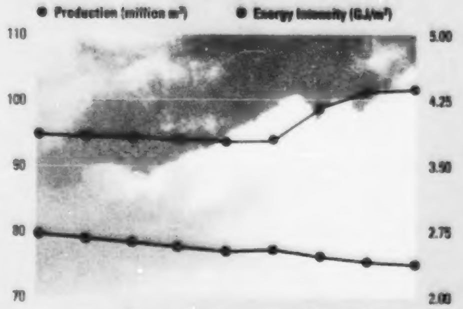


Energy Intensity and Production



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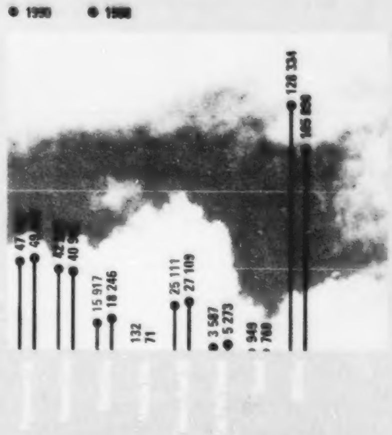

PROFILE ***Pulp and paper, a key component of the forest products industry, is a major contributor to Canada's economy. Besides pulp, the sector includes the newsprint, paperboard, building board and other paper subsectors. The pulp and paper sector's total production rose to 29.46 million tonnes in 1998.***

PULP AND PAPER

ACTIONS Pulp and paper companies continue to improve energy intensity and implement programs to switch from fossil fuels to biomass. Fuel switching, along with better use of existing equipment, adoption of energy-efficient equipment and processes, and increased use of cogeneration have enabled the industry to meet its energy efficiency goals. Some examples of successful programs are given below.

To increase hog fuel (wood residue) consumption and reduce fossil fuel use, the Pacifica Paper Inc. mill in Port Alberni, B.C., has modified its largest power boiler from stoker grate combustion to a fluidized bed configuration. This project increased hog fuel capacity for the boiler to about 800 tonnes per day, reduced fossil fuel use by 30 percent and enabled the consumption of all wood residues from various operations in the Alberni Valley.

In the fall of 1998, Spruce Falls Inc. of Kapuskasing, Ontario, commissioned three new biomass boilers equipped with emission control systems such as electrostatic precipitators and continuous emission monitoring. These boilers are designed to burn wood residue as well as waste sludge from the mill's effluent treatment plant, and will reduce the natural gas requirements for the facility from 1 703 183 million cubic feet (mcf) in 1996 to a projected 779 000 mcf once the boilers are fine-tuned. Spruce Falls has also modified its paper machine vacuum pump, shut down the thermo-mechanical pulp (TMP) reject screw press and installed a variable-speed drive on the spill basin pump of the effluent treatment plant, thereby reducing its power consumption by 9 596 MWh per year.

Stora Enso Port Hawkesbury in Nova Scotia invested $750 million in a new paper machine to replace aging facilities with a world-class alternative. The new machine produces a value-added, super-calendered grade of paper that includes up to 35 percent filler clay. Although the new furnish is provided by an energy-intensive TMP mill, 65 percent of the energy used is recovered as steam and used in the drying process. Energy consumption has dropped from 20.9 GJ per tonne of paper for paper machine #1 to 15.4 GJ per tonne for paper machines #1 and #2 combined. The company also installed a $2-million steam accumulator for boiler stabilization. This improvement reduces steam free-blowing by 75 to 80 percent during paper machine web breaks, netting an overall 4 percent reduction in paper machine steam consumption.

ACHIEVEMENTS The pulp and paper industry has improved its energy consumption per tonne of output by 10.5 percent since 1990. This achievement is consistent with the industry's commitment of a 1 percent improvement in energy efficiency per year from 1990 to 2000. The sector decreased its total energy consumption per tonne of pulp or paper from 29.5 GJ per tonne in 1990 to 26.4 GJ per tonne in 1998. Over the same period, the consumption of fossil fuel and electricity (excluding biomass) decreased from 14.2 to 12.2 GJ per tonne. The portion of total energy supplied by biomass increased from 50.5 percent in 1990 to 54.5 percent in 1998.

Thanks to an ongoing switch to biomass fuel sources, considered CO_2-neutral by the Intergovernmental Panel on Climate Change, the industry is reducing its use of less environment-friendly fossil fuel sources despite growing production. The use of biomass, including wood waste, sludge and pulping liquor, has risen by 15 percent, from 368 313 TJ in 1990 to 424 238 TJ in 1998. Over the same period, use of heavy fuel oil has been reduced by 47.3 percent. As a result, when biomass energy is excluded, it took 17.8 percent less energy to produce a tonne of pulp and paper in 1998 than it did in 1990. When biomass energy is included, the improvement is 10.5 percent.

CHALLENGES Pulp and paper has been heavily affected by recent swings in international markets. In 1998, total shipments of Canadian pulp and paper products decreased by 3.4 percent owing to a decline in sales to Asia and to the United States. This decrease, combined with an increase of 2.7 percent in world-wide manufacturing capacity, lowered the industry's overall operating rate from 91.2 percent in 1997 to 86.9 percent in 1998.

Production curtailments have led to restrictions on capital spending, creating a serious challenge for companies seeking to further improve energy efficiency and reduce GHG emissions.

Fuel switching, especially from fossil fuels to biomass fuels, promises to help the sector achieve additional reductions in energy intensity. However, the availability of wood residues such as bark, sawdust and wood shavings is limited in many areas, making transportation costs a significant barrier to greater use of residue surpluses in some parts of Canada.

FACTS

FIGURES

PERFORMANCE HIGHLIGHTS

- The pulp and paper sector's total production rose to 29 461 kilotonnes in 1998.
- Fuel switching, better use of existing equipment, adoption of energy-efficient equipment and processes, and the increased use of cogeneration have enabled the industry to move toward its energy efficiency goals.
- The Pacifica Paper mill in Port Alberni modified its largest power boiler, reducing fossil fuel use by 30 percent and enabling the consumption of all wood residues.
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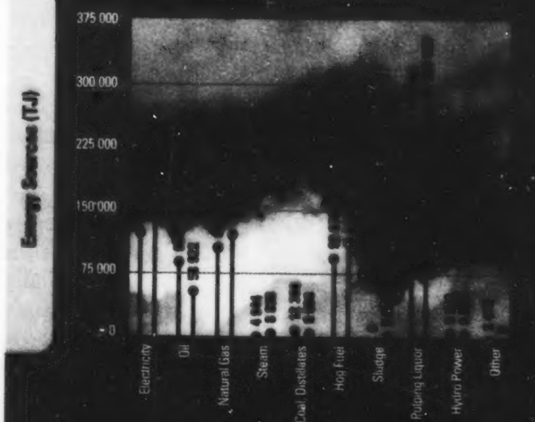

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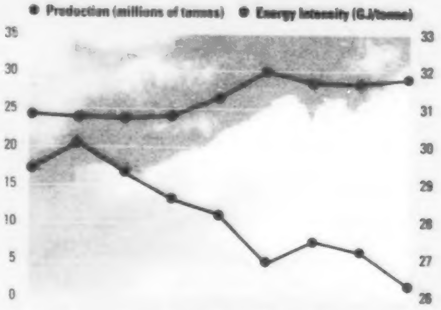
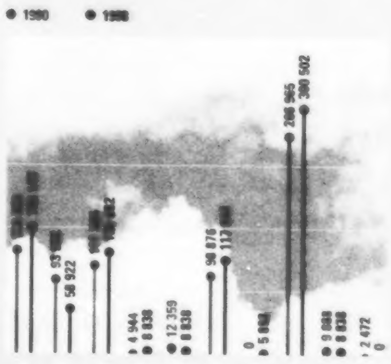
FIGURES

The sector is currently working with CIEEDAC and the OEE to develop an energy intensity index.

Energy Intensity and Production



Energy Sources (TJ)



***PROFILE** The tires, tubes, hoses, belts and other rubber products manufactured by Canada's rubber sector continue to be vital components for the automotive industry in Canada and around the world. To meet demand for its products, the rubber products industry employs just over 26 000 people in some 220 facilities nationwide, providing a total payroll of more than $650 million annually.*

RUBBER

ACTIONS As the rubber industry's national trade association, the Rubber Association of Canada (RAC) plays a crucial role in coordinating and focusing the industry's environmental efforts. A strong proponent of matching responsible care of the environment with the application of good business practices, the RAC works with local authorities on a number of fronts:

- scrap tire stewardship boards have been successfully established in every province save Ontario and Newfoundland, where the work continues;
- the RAC sponsors and mounts a biennial international symposium on rubber recycling to encourage the effective commercial development of this fragile, emerging industry;
- the RAC has established, and maintains, an industry-wide environmental tracking grid to measure the overall performance of the rubber manufacturing sector and to enable plant managers to benchmark individual plant performance against that of the industry; and
- the RAC participates in a number of federal and provincial environmental programs in addition to CIPEC, and member companies continue to utilize the Energy Efficiency Handbook jointly developed with NRCan as part of their individual energy reduction programs.

By maintaining the industry's focus on environmental issues, the RAC plays a constructive role in improving energy intensity and reducing GHG emissions.

ACHIEVEMENTS Rubber industry production rose from 600 000 tonnes in 1990 to more than 1.2 million tonnes in 1998. Total energy consumption also increased over the same period, rising from 9 115 TJ in 1990 to 11 338 TJ in 1998. Production doubled as the industry sought to supply burgeoning automotive output. The industry kept its energy use to a 24-percent increase over the same period mainly by increased capital investment in plants and machinery, as well as by an industry-wide trend to continuous seven-day operations. Both of these have had a positive impact on energy efficiency.

For the first time, the CIPEC annual report uses physical production and energy use figures from the rubber industry's own environmental tracking reports to calculate energy intensity. These figures show that the industry's energy intensity index showed marked improvement from the early 1990s through 1996, and then tended to level out from 1996 through 1998. This result reflects both the impact of the sector's long-term plan to reduce energy use and the influence of other environmental efforts such as particulate emission reduction.

According to the industry's own environmental tracking system, approximately 50 percent of the industry's energy requirements are filled by natural gas, 35 percent by electricity and nearly all of the rest by heavy fuel oil. If natural gas prices remain competitive with alternative energy sources, the industry could significantly increase its use of natural gas once Sable Island gas becomes more commercially available. One large rubber manufacturer has been unable to avail itself of natural gas energy because of its location and as a result has been more dependent on heavy fuel oils.

Despite the increase in energy consumption demanded by increased production and improved air emission quality, the rubber sector continues to improve its energy intensity record compared with the 1990 base year. However, other than the possible early availability of Sable Island gas for one large producer, there are no apparent, easily achievable improvements on the horizon. Future achievements will result from hard-won, small victories by individual manufacturers seeking to continuously reduce their energy costs.

CHALLENGES The rubber sector is made up of both large multinational companies operating efficient, modern plants and smaller, locally owned firms that, while generally efficient, do not always have the same benefit of scale available to large multinationals. While the multinationals may have the financial muscle to make ongoing investments in energy efficiency overall, all capital expenditures must still withstand close payback scrutiny from capital pool allocation committees that are generally foreign-based. Smaller firms have mixed financial abilities to undertake large energy improvement investments unless there is a clear net positive payback. Happily, this appears increasingly to be the case, and one member company has just been recognized by CIPEC for its efforts in this area.

Because of ongoing mergers and acquisitions, the majority of output tonnage increasingly derives from relatively fewer large producers. Most of the "low-hanging fruit" in this sector has already been harvested, so it will be increasingly difficult to continue to achieve present rates of energy improvement year over year.

Another, more problematic impact on energy efficiency is the continuing need to improve air emissions. Increasing public demand and government legislation for cleaner air emissions has led the industry to undertake the installation of numerous pieces of equipment, principally electrostatic air precipitators and other process systems, in its manufacturing plants. These systems generally consume substantial amounts of energy while adding nothing to product output. Thus, improved air quality is often achieved at the cost of increased energy use.

Most of the industry's production continues to be directed to the automotive industry, where suppliers are under constant pressure to improve quality and lower costs. This makes the effort to reduce energy costs an ongoing challenge. Complicating this challenge are the often conflicting demands of various federal and provincial environmental programs.

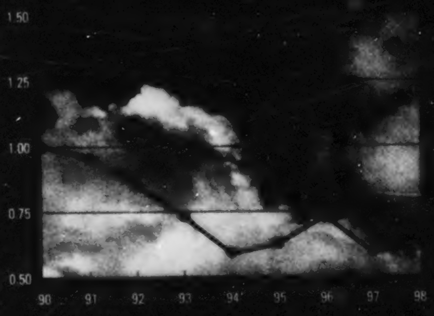
FACTS

PERFORMANCE HIGHLIGHTS

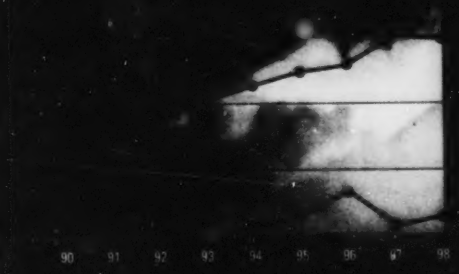
- **The rubber products industry employs just over 26 000 people in some 220 facilities nationwide.**
- **Industry production rose from 600 000 tonnes in 1990 to 1.2 million tonnes in 1998.**
- **Provincial scrap tire stewardship boards have been successfully established in every province except Ontario and Newfoundland.**
- **The RAC maintains an industry-wide environmental tracking grid to measure the sector's overall performance.**
- **The RAC holds a biennial international symposium on rubber recycling to encourage the effective commercial development of this emerging industry.**
- **Despite the increase in energy consumption demanded by increased production and improved air emission quality standards, the sector continues to improve its energy intensity.**

FIGURES

Energy Intensity Index (Base Year 1990=1.00)



Energy Intensity and Production



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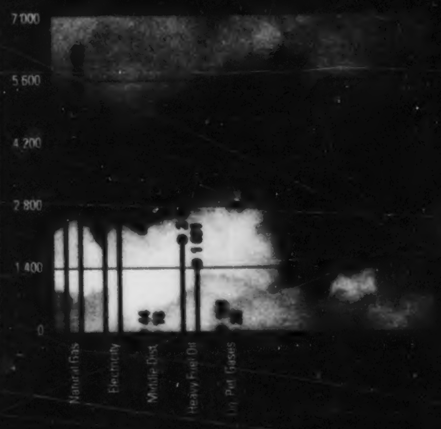

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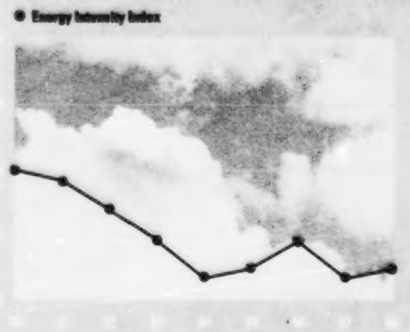

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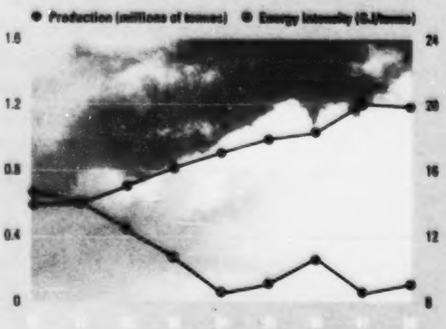

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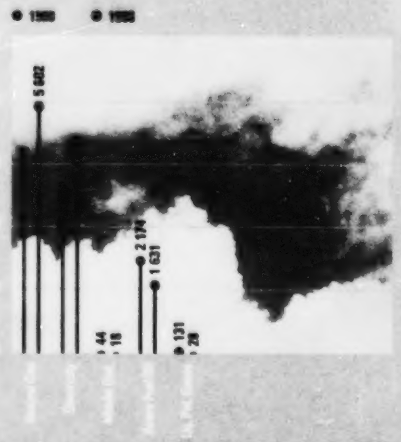

PROFILE *The Canadian soft drink sector consists of 110 bottling plants producing carbonated, non-alcoholic beverages, ice tea, fruit drinks and bottled water. These bottlers provide direct employment for 110 680 Canadians, with a total annual payroll of $453.2 million. Soft drink sector sales make up about one third of the $4.4 billion worth of beverages that Canadians purchase in supermarkets each year. A substantial portion of soft drink sales are also made through non-grocery channels such as hospitality establishments, drugstores, and gas, convenience and mass merchandizers.*

SOFT DRINK

ACTIONS By its nature, the soft drink and bottled water industry experiences relatively low energy intensity compared with other food-related sectors. Consequently, the cost incentives that drive aggressive energy intensity reduction projects in other industrial sectors are absent. However, the industry continues to undertake efforts to achieve higher operational efficiencies, including the introduction of improvements that lead to energy intensity reductions.

Charlottetown's family-owned Seaman's Beverages is a prime example. In 1995, Pepsi bottler Seaman's installed motion-sensitive lighting throughout its production facility. Because of a shared commitment to preserving P.E.I.'s environment, company employees are kept up to date on environmental and energy issues, and have undertaken to ensure idling trucks are turned off, retreaded tires are used, and waste paper is shredded and put to use at a local animal shelter.

ACHIEVEMENTS Its broad perspective on energy consumption has led the soft drink sector to adopt alternative packaging strategies that are more environment-friendly as well as less energy-intensive. For example, soft drink makers have reduced the energy component in the packaging used to bring its products to market by turning to lighter-weight, recyclable materials such as polyethylene terephthalate (PET) plastic and aluminum. Today's PET containers are 21 percent lighter and aluminum cans are 65 percent lighter than their steel counterparts used 20 years ago. Lighter containers require less energy to produce and also reduce the transportation fuel needed to bring beverages to market. In addition, bottlers have cut the weight of packaging waste destined for landfill by 67 percent since 1988.

CHALLENGES The introduction of the North American Industry Classification System in 2000 will result in a change in the title of the sector from "Soft Drink Industry" to "Soft Drink and Ice Manufacturing." While this will mean continued data tracking at the same aggregate level, the influence of ice manufacturing on sector data will be more transparent.

Moreover, the transformation of soft drink companies into beverage companies with expanded product lines is blurring the lines between industry sectors. This process may make it difficult to clearly differentiate between data pertaining to the soft drink sector and that belonging to related sectors.

FACTS

FIGURES

PERFORMANCE HIGHLIGHTS

- Soft drink sector sales make up about one third of the $4.4 billion in beverages that Canadians purchase in supermarkets each year.
- The soft drink and bottled water industries experience a relatively low energy intensity compared with other food-related sectors.
- Pepsi bottler Seaman's promoted employee awareness of environmental and energy issues, enabling the company to slash waste throughout its operations.
- Soft drink makers reduced the energy component in the packaging used to bring their products to market by turning to lighter-weight, recyclable materials.
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FIGURES

The sector is currently working with CIEEDAC and the OEE to develop indices and figures.

PROFILE ***Canada's steel sector is one of the country's largest industries, generating sales of more than $11 billion and $3.6 billion in exports in 1998. The industry includes 18 plants that directly employ 33 500 workers. The companies that make up the steel sector supply flat-rolled (sheet and plate), long (re-bar and structural steel), and specialty and alloy (stainless and tool steels) products for major markets, including transportation, oil and gas, appliances, packaging and construction. While facilities are found in six provinces, Ontario accounts for 70 percent of Canadian steel production.***

STEEL

ACTIONS Canadian steel makers continued to emphasize energy efficiency as a major thrust of productivity, quality and cost-reduction efforts in 1998 and 1999.

- Ivaco Rolling Mills Inc. recently installed a new natural-gas-fired reheat furnace equipped with high-efficiency burners and recuperators to preheat combustion air.
- Stelco McMaster Ltée improved its energy efficiency by installing a high-impedance transformer and using an oxygen lance at the eccentric bottom-tapping steel-making furnace, and by adopting electromagnetic stirring in the continuous casting process.
- At Dofasco Inc., electric motors are now tested in-house, allowing earlier detection of faulty or off-spec performance, and saving electricity.
- Lake Erie Steel Company continues to offset coke use in its blast furnaces by adding natural gas. The company plans to upgrade its boilers to capture more of the resulting blast furnace gas energy as steam that can be used to produce electricity.
- Stelco's Hilton Works will install a Level II furnace control system to reduce energy consumption by 10 percent on its plate mill furnaces.
- At Gerdau Courtice Steel Inc., recovery of landfill gas, begun in 1998, has offset purchases of natural gas.
- Stelfil Ltée, Dofasco, Slater Steel Inc. and Lake Erie Steel Company are among the Canadian steel companies that will promote awareness of energy efficiency and climate change among employees over the next year.

ACHIEVEMENTS The Canadian steel industry registered strong performance in shipments, sales and exports in 1998, though all of these were down from record levels in 1997. In 1998, the industry produced 15.8 million tonnes of steel and shipped 14.1 million tonnes.

Since 1990, the industry has achieved a 15-percent improvement in energy consumed per tonne shipped. This results from a 6-percent reduction in total energy consumed and a 12-percent increase in shipments. The average annual energy efficiency improvement was 1.9 percent, surpassing the industry's commitment of 1 percent per year to 2000 from the adjusted 1990 rate of 21.18 GJ per tonne shipped. In addition to these factors, a 21 percent less carbon-intensive energy mix has led to a 12-percent reduction in total CO_2 emissions.

The industry has sought a "90/90" member commitment to voluntary energy efficiency improvement. With Ispat-Sidbec Inc. joining the Eco-geste program in Quebec, 91 percent of companies representing 92 percent of production are now involved.

In the latter part of 1999, the Canadian steel industry renewed its voluntary energy efficiency commitment. Between 2000 and 2010 the Canadian steel industry will improve energy intensity by an average 1 percent per year compared with a 2000 base year. If the new target is achieved, the sector will register an equivalent improvement in energy consumption per tonne shipped of 1.6 percent per year over the 20-year period from 1990.

Individual companies have also recorded significant recent achievements. Dofasco and Stelco are part of a world-wide consortium that has developed the ultralight steel auto body (ULSAB). ULSAB weighs up to 35 percent less than comparative auto bodies and is more fuel-efficient, stronger, safer and cheaper. On behalf of the project, the two companies were awarded the Transportation: Technology Award at Canada's Energy Efficiency Conference in May 1999.

Co-Steel Lasco installed the Expert Furnace System Optimization Process (EFSOP™), a novel computerized system that optimizes combustion and operations, in its electric arc furnace operation. Capturing some of the energy lost through incomplete combustion resulted in total annual savings of $1 million. Dr. Howard Goodfellow of Stantec Global Technologies Ltd., who designed the system, won the Industry: Process – Tier II Award at Canada's Energy Efficiency Conference in May 1999.

CHALLENGES Most customers of the steel industry are under intense competitive pressure to deliver more value to their own customers and this pressure is transferred back up the supply chain.

To hold onto their customers, attract investment capital and sustain well-paid jobs, individual steel makers must improve productivity in step with, or ahead of, their competitors. They must reduce costs while still delivering higher-value products to their customers.

The steel industry has responded to these challenges with innovation, new technology and substantial capital investments. As a result, the industry now uses less energy per tonne than it did in the early 1980s, producing superior products at significantly lower prices. Despite these successes, maintaining and improving productivity remains an ever-present challenge for the industry.

Trends in international trade also present a significant challenge to Canadian steel makers. Since Canada's principal steel trading relationship is with the United States, Canadian producers must compete with U.S. producers. However, offshore imports into both Canada and the United States rose dramatically in 1998 and continued into 1999. This trend reflected the effect of the Asian financial crisis and the Russian economic collapse on exporting nations, as developing nations strove for foreign markets for their growing production.

The Canadian steel industry supports liberalized trade and open markets on a level international playing field. However, with many international suppliers based in low-wage countries not covered by the Kyoto Protocol and with emerging countries maintaining government-supported excess capacity, it is a challenge to ensure effective tools are in place to prevent unfairly traded imports.

FACTS

PERFORMANCE HIGHLIGHTS

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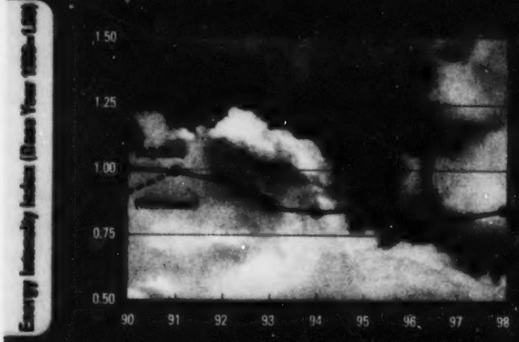
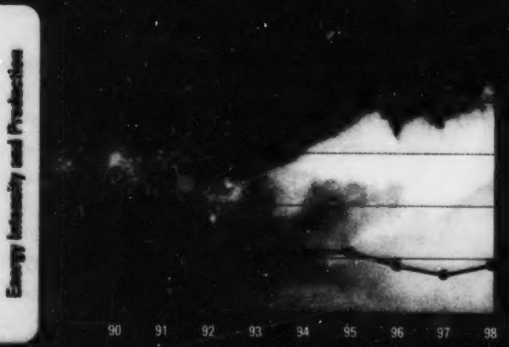
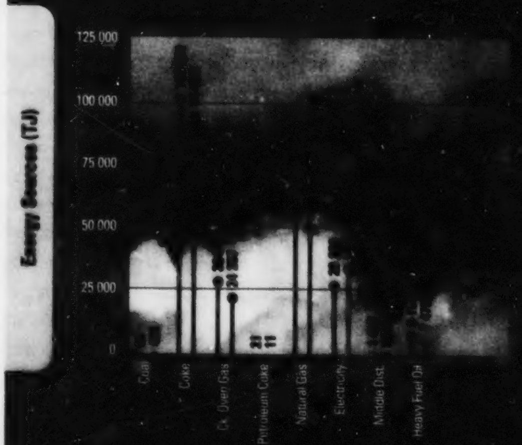
- **The sector's average annual energy efficiency improvement is 1.9 percent, surpassing the industry's commitment of 1 percent per year.**
- **Dofasco and Stelco received the Transportation: Technology Award for their role in developing the light-weight, strong ULSAB.**
- **The industry now uses less energy per tonne than it did in the early 1980s so it can produce superior products at significantly lower prices.**

FIGURES







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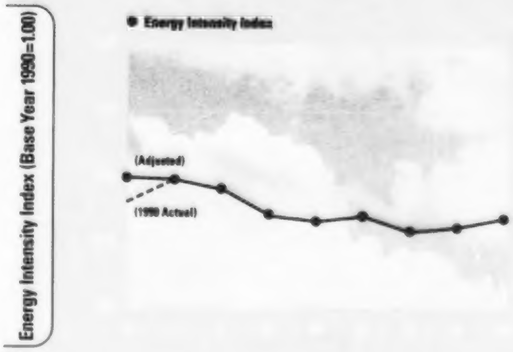

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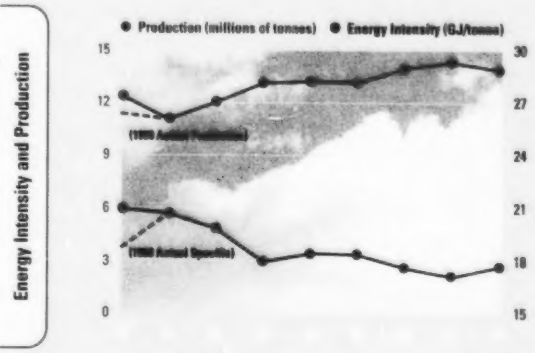
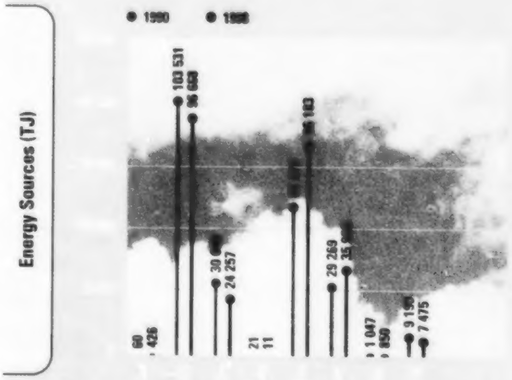
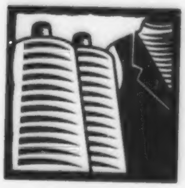




PROFILE *Canada's textile sector produces the fibres, yarns and fabrics used in industries as diverse as agriculture, automotive manufacturing, clothing, construction, environmental protection and road construction. The textile sector is organized into three subgroups: primary textiles, textile products and motor vehicle fabric accessories. Together, the industry sells to 150 markets and exports close to 30 percent of its production.*

TEXTILES



ACTIONS A number of companies have added their names to the textile sector's list of Industrial Energy Innovators in 1999, including Barrday, Inc., Cambridge, Ontario; C.S. Brooks Canada Inc., Magog, Quebec; DIFCO Performance Fabrics Inc., Montréal, Quebec; Stedfast Inc., Granby, Quebec; and Swift Denim, Drummondville, Quebec.

Throughout the sector, companies are benefiting from more efficient uses of energy.

- Electricity use per unit of output in 1998 at Fabrene Inc. of North Bay, Ontario, was 73 percent of 1990 levels and exceeded the firm's energy efficiency target for the year.
- Consoltex Group Inc. committed to a 5-percent annual reduction of energy consumption per unit of output at its five Canadian manufacturing facilities.
- Energy use per unit of output for all of DuPont Canada Inc.'s manufacturing facilities was 19.6 percent below 1990 levels.
- Two companies installed "solar walls" in their facilities to recover energy from the building and from the sun, thereby reducing the use of natural gas and electricity. Other companies are installing energy-efficient lighting and motors, using heat reclaimer units and air leak monitoring systems, and upgrading steam trap monitoring systems.

In 1999, the Textile Energy Task Force confirmed the comprehensive action plan introduced in 1997 and agreed to concentrate on two principal goals: to broaden the participation of textile manufacturers in Industrial Energy Innovators and the VCR Inc., and to strengthen the commitment of existing Energy Innovators. Manufacturers participating in the task force have agreed to demonstrate by example the economic benefits that flow from effective energy efficiency programs. Moreover, task force members remain committed to follow up directly and personally with the sector's Industrial Energy Innovators to review their progress in fulfilling their commitments.

The industry is continuing its own survey to identify and correct inconsistencies and errors in the textile industry data currently available in government reports. More accurate information will enable the industry to establish better measures of success in meeting energy efficiency targets. In addition to the industry's own data-gathering activities, the Canadian Textiles Institute is providing a third year of financial support to CIEEDAC at Simon Fraser University.

ACHIEVEMENTS The textile sector's energy mix has been shifting away from hydrocarbon sources to electricity. Natural gas use has declined from 64 percent of total energy consumption in 1990 to just under 49 percent in 1998. Consumption of other hydrocarbon fuels declined from 8 percent in 1990 to just under 6 percent in 1998, while electricity's share rose from 28 percent in 1990 to more than 36 percent in 1998.

As a result of the industry's efforts to improve the accuracy of reporting by individual companies, Statistics Canada's 1998 data more accurately reflects the industry's experience. Although sales remained at constant levels, total energy consumption as reported by Statistics Canada declined from 25 778 TJ in 1997 to 24 296 TJ in 1998. The industry's GDP output in 1998 was 21.5 percent higher than in 1990, while its energy consumption increased by only 12.1 percent.

In August 1999, the Textile Energy Task Force committed the industry to a new energy intensity target of 1 percent per year for the period 2000–2010. Efforts will build on energy efficiency performance since 1995 and reflect ongoing consultations to meet Canada's Kyoto commitments.

CHALLENGES The task force believes that a key challenge is to gain the active involvement of more of the industry's major producers as Industrial Energy Innovators. Its members continue to lead in efforts to broaden participation.

In addition to developing methods to measure energy use more accurately, increased efforts are required to sensitize those in the textile industry to the long-term implications of Canada's Kyoto commitments and to encourage active participation in the new national implementation strategy for energy efficiency.

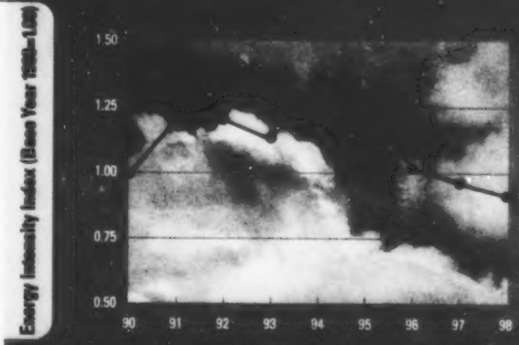
During 1999, the Textile Energy Task Force and the Canadian Textiles Institute have devoted time and resources to addressing these challenges; their efforts need to continue and be intensified.

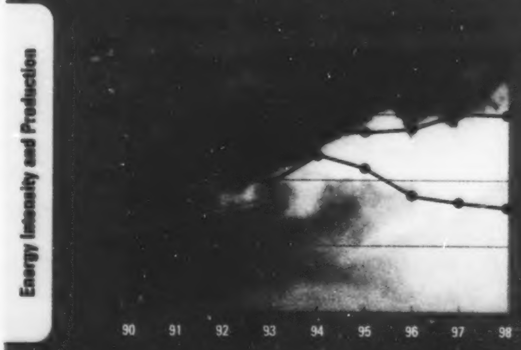
FACTS

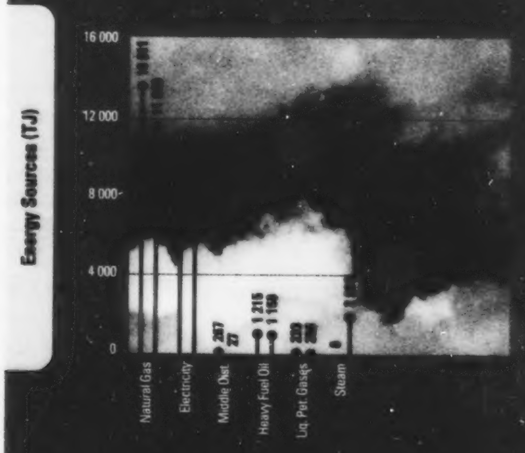
PERFORMANCE HIGHLIGHTS

- Canada's textile industry sells to 150 markets and exports close to 30 percent of its production.
- Electricity use per unit of output in 1998 at Fabrene of North Bay was 73 percent of 1990 levels.
- Consoltex committed to a 5-percent annual reduction in energy consumption per unit of output at its five Canadian manufacturing facilities.
- Energy use per unit of output for all of DuPont Canada's manufacturing facilities was 19.6 percent below 1990 levels.
- The sector's energy mix shifted away from hydrocarbon sources to electricity between 1990 and 1998.
- In 1998 the industry's GDP output was 21.5 percent higher than in 1990 while its energy consumption increased by only 12.1 percent.

FIGURES







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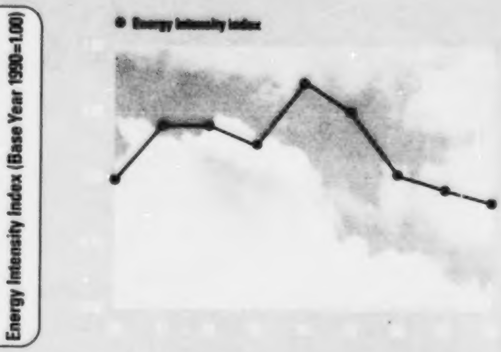
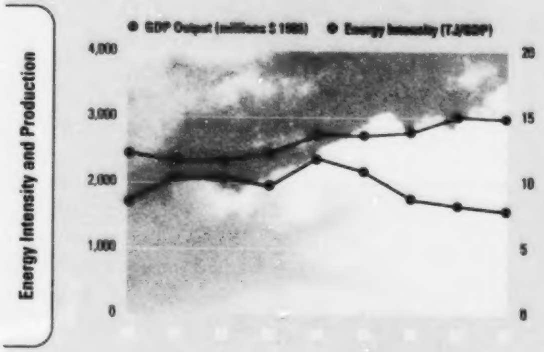
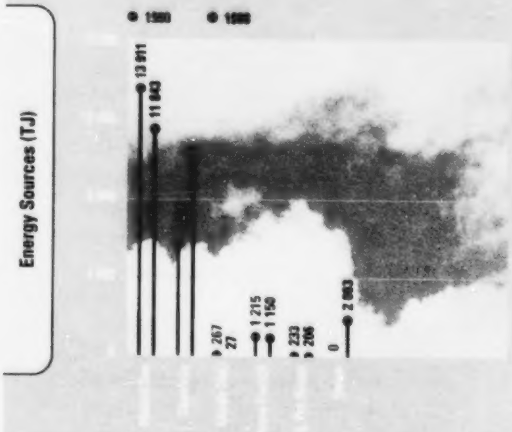






***PROFILE** The Canadian transportation equipment manufacturing sector includes companies manufacturing aircraft, aircraft parts, automobiles, motor vehicle parts, trucks, buses, trailers and military vehicles, as well as railroad rolling stock, ships and pleasure boats. The sector is a major part of the Canadian economy, accounting for nearly 3 percent of Canada's GDP and more than 15 percent of the total manufacturing GDP in 1998. Including dealer, parts and distribution networks, the sector employs more than half a million people across Canada.*

TRANSPORTATION MANUFACTURING

ACTIONS The CIPEC Transportation Equipment Manufacturing Task Force continued a tradition of promoting energy efficiency at its third annual one-day energy conference held in April. The conference included the presentation of success stories, climate change and CIPEC/VCR updates, and tours of DaimlerChrysler Canada Inc.'s Windsor, Ontario, assembly plant and the 70-MW TransAlta Windsor-Essex cogeneration facility that supplies steam to the plant.

In May of 1998, a live interactive satellite teleconference on efficient electrical motor systems was held at Ford Motor Company of Canada, Limited, in Oakville, Ontario. The teleconference included a demonstration of Ford's power monitoring system and case studies from across the United States.

The task force continues to encourage auto parts suppliers to join the Industrial Energy Innovators program and submit action plans to the VCR Inc. Task force members also assisted the sector's working group on the National Climate Change Industry Table in formulating foundation and technology assessment reports for the sector. In addition, the task force seeks to expand the sector's coverage to include rail and marine manufacturers along with support from natural gas and electrical utilities. The industry is currently planning an energy conference for the second half of 2000.

The past year evidenced a number of individual energy efficiency success stories, including the following.

- General Motors of Canada Limited implemented energy efficiency projects that resulted in savings of more than $3 million annually in heating and ventilation, process improvement, compressed air, high-efficiency lighting and energy management. A lighting retrofit project at its Oshawa, Ontario, body plant reduced energy use by 46 percent while providing better lighting levels.
- Ford's Essex Engine Plant upgraded its centrifugal air compressors by installing microprocessors that eliminate air leaks and match compressor output to plant demand. This upgrade has led to savings of $200,000 per year in reduced power consumption.
- DaimlerChrysler's Etobicoke, Ontario, aluminum casting plant has replaced three aluminum melt furnaces with new high-efficiency units. The units more than double energy efficiency to 42 percent from 20 percent for the old furnaces and have yielded annual savings of more than 39 000 GJ and $168,000.

ACHIEVEMENTS A robust economy and major capital projects contributed to a 3-percent increase in the sector's total energy consumption in 1998. However, energy intensity has decreased to the lowest level in the 1990s and is nearly 4 percent below the 1990 level.

In 1998, the sector consumed 68 633 TJ of energy, up 30.5 percent since 1990. Over the same period, the gross output increased by 35.3 percent, for an overall improvement in energy intensity of 3.6 percent over 1990 levels. The total energy used by the sector is 2.8 percent of the total of all industries in Canada. Within the sector, the largest energy users are the motor vehicle assembly and automotive parts, which account for 41 percent and 38 percent respectively.

Over the long term, the sector expects overall growth averaging 2 percent per year. While motor vehicle manufacturing will grow at a relatively modest pace reflecting the mature state of the North American automotive market, Canadian production of automotive parts should grow at a considerably faster pace. This reflects lower labour costs and other trends that increasingly favour the Canadian sourcing of automotive parts.

Energy use by fuel type has remained fairly constant since 1990 with natural gas (55.3 percent) and electricity (35.6 percent) making up the bulk of the energy used. Surprisingly, use of liquid petroleum gases and middle distillates (#2 fuel oil) has increased by 216 percent and 130 percent respectively since 1990. With higher natural gas prices anticipated, this trend may well continue. On the other hand, heavy fuel oil and coal use has continued to decline since 1990.

CHALLENGES The transportation manufacturing sector is committed to continuously improving quality, environmental performance and energy efficiency. Energy-efficient equipment is being installed wherever feasible, but investment payback requirements of less than two years and internal competition for funds are challenging energy managers seeking to make major gains. Moreover, energy efficiency gains arising from the implementation of new technology will likely be offset by trends driving energy use higher. These trends include the increased use of cooling to improve working conditions, higher pollution control standards, and shifts to more energy-intensive products and processes.

Unless there are major breakthroughs in technology, energy efficiency improvements in the sector are likely to come in small increments. Moreover, since the sector is already an efficient energy user, there are relatively few cost-effective opportunities for dramatic gains. Cogeneration represents the single biggest opportunity for energy efficiency improvement, but not all industry facilities are suited to its use.

The sector continues to take strong action to reduce GHG emissions. The 1990 base year was a low production year for the sector. Since then, economic recovery combined with industry growth has caused emissions to increase by 35 percent despite the sector's best efforts. It will be extraordinarily difficult for the sector to meet a sector-specific target that parallels Canada's overall Kyoto commitment to reduce overall emissions by 6 percent below 1990 levels.

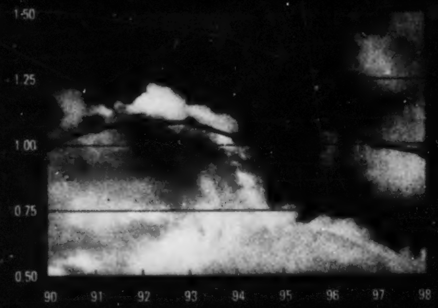
FACTS

PERFORMANCE HIGHLIGHTS

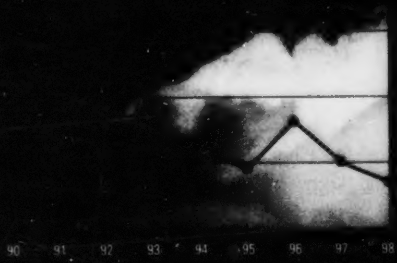
- **The transportation manufacturing sector accounted for nearly 3 percent of Canada's GDP and more than 15 percent of the total manufacturing GDP in 1998.**
- **Energy intensity dropped to its lowest level so far in the 1990s, nearly 4 percent below the 1990 level.**
- **General Motors of Canada implemented energy efficiency projects that led to savings of more than $3 million annually.**
- **Ford of Canada's Essex Engine Plant reduced its annual power consumption for savings of $200,000 per year.**
- **New furnaces at DaimlerChrysler's Etobicoke aluminum casting plant yielded annual savings exceeding 39 000 GJ and $168,000.**
- **The sector's task force will seek to expand its coverage to include rail and marine manufacturers along with support from natural gas and electrical utilities.**

FIGURES

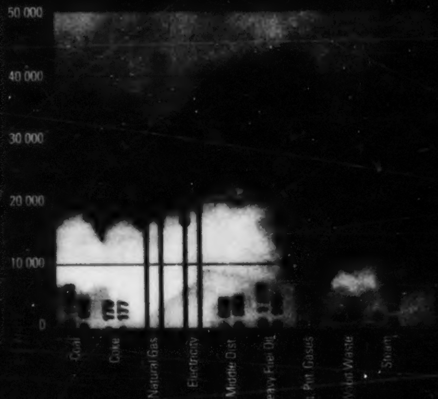
Energy Intensity Index (Base Year 1990=1.00)



Energy Intensity and Production



Energy Sources (TJ)



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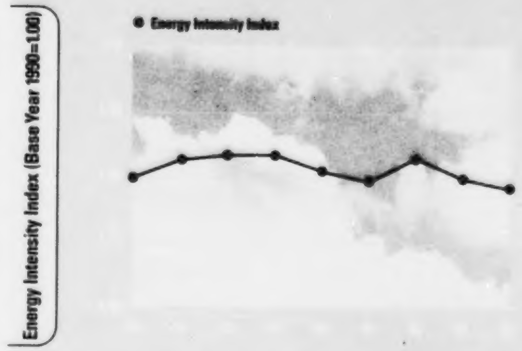
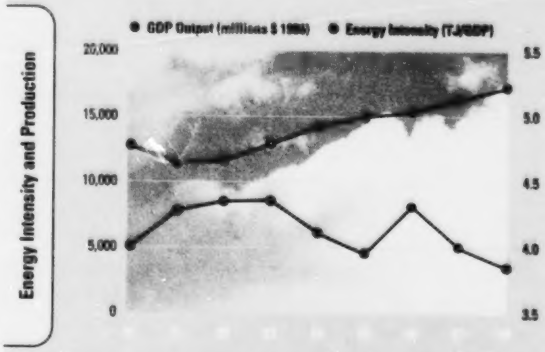
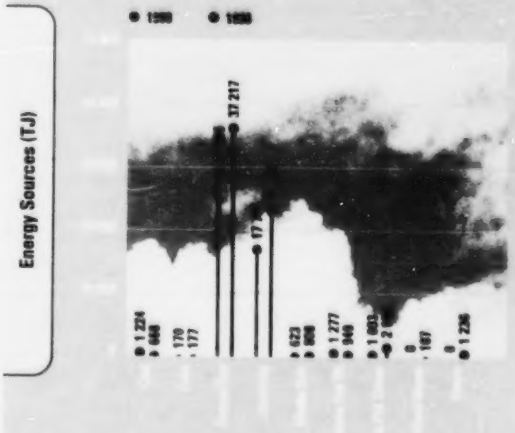
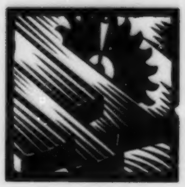






***PROFILE** The wood products industry consists of nearly 3 000 establishments across Canada employing just under 20 000 workers. The sector includes sawmills, planing mills and shingle mills that manufacture products ranging from timber to finished lumber for domestic and world markets. The sector's consumption of 69 243 TJ of fossil fuels and electricity in 1998 was down from the 1997 figure of 70 931 TJ, but up from 37 356 TJ in the 1990 base year.*

WOOD PRODUCTS



ACTIONS A Canadian wood-fibre products manufacturing company developed an ultra-filtration system that reduces the amount of wastewater and suspended solids produced by plant processes. A $300,000 investment had a one-year payback at one facility; at another, recovering chemicals saved $750,000. The system is two to three times more energy-efficient than conventional biological treatments.

On August 16, 1999, Industrial Energy Innovator Tembec Inc. announced that its affiliate Spruce Falls Inc. (also an Industrial Energy Innovator), achieved ISO 14001 certification for its newsmill, woodlands and sawmill operations. Spruce Falls produces 378 000 tonnes of newsprint and specialty papers and more than 120 million board-feet of lumber each year. The drying kiln for this lumber is heated by steam from the reboiler at the TMP plant in the adjacent pulp mill. Recovered steam is also used for drying paper at the pulp plant. Spruce Falls is the first wood products company in Ontario to be certified to the ISO 14001 environmental standard for woodlands and sawmill operations.

Forintek Canada Corp., Canada's applied research institute for the solid wood products industry, is a non-profit partnership of more than 150 manufacturing companies, the Canadian Forest Service and the provinces of British Columbia, Alberta, Quebec, New Brunswick and Nova Scotia. Forintek has developed OASiS, a computer-based program that simulates a variety of wood pre-sorting strategies, and KD Expert, a training tool for kiln operators and supervisors. Current research at Forintek includes a lumber-drying program that aims to improve the quality of kiln-dried lumber and reduce drying time and energy costs. One objective of the program is to develop an adaptive kiln controller capable of continually adjusting drying parameters to conditions inside the kiln.

Flakeboard Company Limited has completed a $30-million project to double production and make its St. Stephen, New Brunswick, facility one of the largest producers of thin, high-density fibreboard in North America. The project enables Flakeboard to produce 600 million square feet of 3-mm board annually. Raw material for this increased capacity will come entirely from wood waste from local sawmills. A $10-million storage facility created by the project incorporates a new programmable logic control system to sort and control incoming wood residue. The new system virtually eliminates both raw material losses and problems resulting from open-air storage, at the same time reducing drying time and energy costs.

ACHIEVEMENTS Individual companies in the wood products sector continue to implement low-cost energy efficiency measures. Fuel switching to biomass energy sources remains a major industry focus as companies seek to reduce production costs and improve their energy efficiency.

However, production and, consequently, energy efficiency efforts continue to be impaired by adverse national and international economic factors. These factors have forced companies to increase their focus on marketing and product improvement, often involving greater energy consumption for such measures as kiln drying.

To encourage and educate the sector in energy efficiency matters, the task force developed the publication, *Energy Efficiency Opportunities in the Solid Wood Industries*, still being distributed to individual companies.

CHALLENGES Establishing meaningful data for the wood products sector is complicated task. The breadth of products produced by the sector (everything from low energy intensity shingles to energy-intensive structural products such as new, high-tech oriented strand boards) makes it difficult to develop meaningful comparisons. Moreover, many energy efficiency efforts in this sector, such as wood waste cogeneration, are integrated with the pulp and paper sector, making it difficult to isolate and apply beneficial impacts to the energy profile of this sector.

Before 1995, the sector's wood waste for energy use had been attributed to the closely allied pulp and paper industry. In 1995, energy data collection was refined to differentiate the wood waste used by each sector. While this has resulted in more accurate data for each sector, it has made 1990 energy consumption numbers an inappropriate base.

Refinements in energy data collection have increased the ability to track the use not only of purchased energy, but also of internally generated energy, improving the knowledge of energy use by the wood products and other industrial sectors.

FACTS

PERFORMANCE HIGHLIGHTS

- The wood product sector consumed 69 243 TJ of fossil fuels and electricity in 1998, down from 70 931 TJ in 1997.
- A Canadian wood-fibre products manufacturing company developed an ultra-filtration system that reduces the amount of wastewater and suspended solids produced by plant processes.
- Current research at Forintek includes a lumber-drying program that aims to improve the quality of kiln-dried lumber and reduce drying time and energy costs.
- Spruce Falls became the first wood products company in Ontario to be certified to the ISO 14001 environmental standard for woodlands and sawmill operations.
- A new production system at Flakeboard virtually eliminates both raw material losses and problems resulting from open-air storage, and reduces drying time and energy costs.
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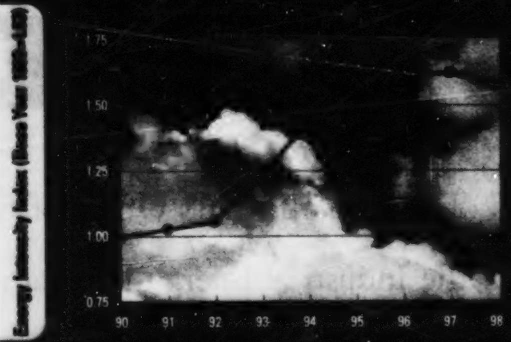

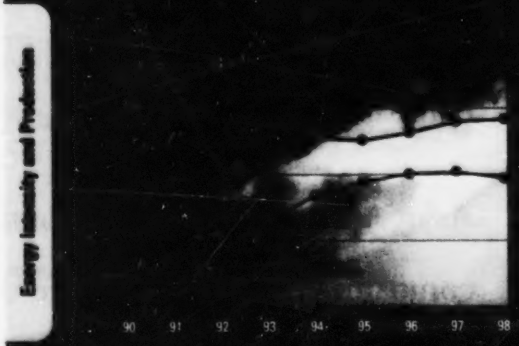

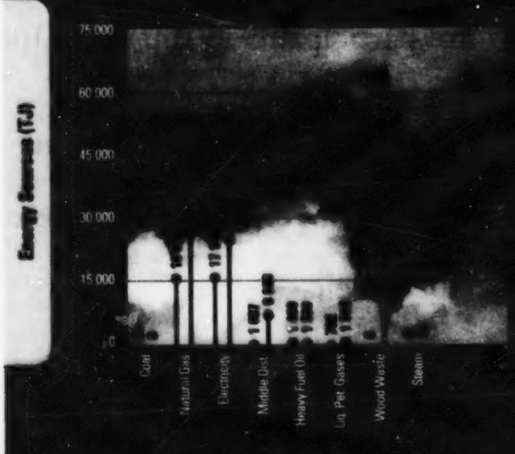

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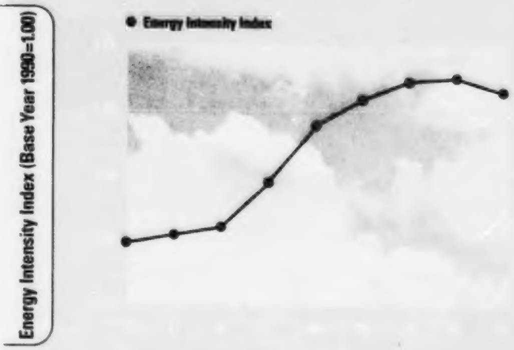

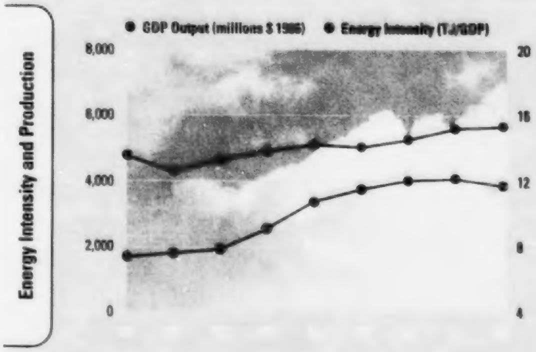

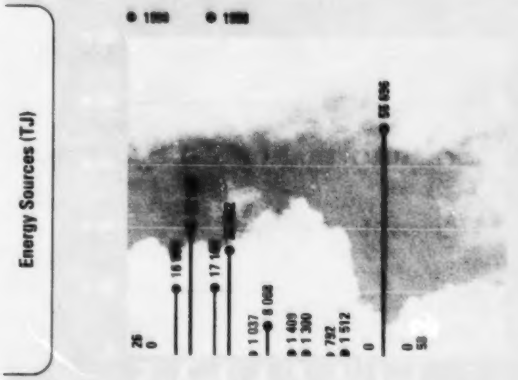

INNOVATORS

by sector

Through NRCan's Office of Energy Efficiency, the Industrial Energy Innovators Initiative focuses on transforming the sector-level commitments made by the task forces into company-level action by helping to overcome obstacles to energy efficiency at the company level.

As of April 1, 2000, 254 manufacturing and mining companies representing more than 75 percent of industrial energy use have signed on as Industrial Energy Innovators. The majority of these companies are participants in the VCR Inc.

For information on becoming an Industrial Energy Innovator, contact the Office of Energy Efficiency at cipec.peeic@nrcan.gc.ca.

Aluminum

Alcan Smelters and Chemicals Ltd.
Aluminerie Alouette inc.
Aluminerie de Bécancour inc.
Aluminerie Lauralco inc.
Société Canadienne de Métaux Reynolds, Limitée

Cement

Blue Circle Canada Inc.
ESSROC Canada Inc.
Inland Cement Limited
Lafarge Canada Inc.
North Star Cement Limited
St. Lawrence Cement Inc.
Tilbury Cement Limited

Chemicals

Chinook Group – Sombra Plant
DuPont Canada Inc.
Elementis Pigments Canada
MDS Nordion Inc.
Nacan Products Limited
NOVA Chemicals Corporation
OxyVinyls Canada Inc.
Synergistics Industries Limited

Electrical/Electronics

ASCOLECTRIC Ltd.
Broan Limited
Honeywell Limited
IBM Canada Ltd.
Nortel (Northern Telecom Limited)
Osram Sylvania Ltd.
Vansco Electronics Ltd.

Food and Beverage

Andrés Wines Ltd.
Casco Inc.
Coca-Cola Beverages Ltd.
Cuddy Food Products
Garden Province Meats Inc.
H.J. Heinz Company of Canada Ltd.
Hub Meat Packers Ltd. – Sunrise Brand
Kraft Canada Inc.
Labatt Breweries of Canada
Maple Leaf Meats
Maple Leaf Pork
Maple Lodge Farms Ltd.
Molson Breweries
Moosehead Breweries Ltd.
Pepsi-Cola Canada Beverages
Sleeman Brewing and Malting Co. Ltd.
Sun-Rype Products Ltd.
Versacold Corporation

General Manufacturing

3M Canada Inc.
ABCO Property Management Inc.
Canadian Uniform Limited
Champion Feed Services Ltd.
Coyle & Greer Awards Canada Ltd.
Crown Cork & Seal Canada Inc.
Degussa-Huls Canada Inc.
EMCO Building Products – A Division of EMCO Limited
Envirogard Products Ltd.
Escalator Handrail Company Inc.
Euclid-Hitachi Heavy Equipment Ltd.
Federated Co-operatives Limited
Ferraz Shawmut Canada Inc.
Fibrex Insulations, Inc.
Garland Commercial Ranges Limited
Greif Containers Inc.
Imperial Home Decor Group Canada Inc.
Imperial Tobacco Limited
International Paper Industries Limited
Jones Packaging Inc.
Kindred Industries
Kodak Canada Inc.
LePage (Division of Henkel Canada Limited)
Maksteel Service Center (Division of Makago Industries Ltd.)
Marcel Lauzon Inc.
Metroland Printing, Publishing & Distributing Ltd.
Owens-Corning Canada Inc.
Polytainers Inc.
PRO-ECO Limited
Regent Eco Canada
Rohm and Haas Canada Inc.
Sandvik Tamrock Canada
Scapa Tapes North America
S.C. Johnsons & Sons, Limited (Johnson Wax)
Simmons Canada Inc.
Soprema Inc.
Starcan Corporation
Superior Radiant Products Ltd.
Tamrock Loaders Inc.
Teknion Furniture Systems
The Source Medical
VicWest Steel
Viskase Canada Inc.
Wabash Alloys Ontario
Wescast Industries Inc.
Wyeth-Ayerst Canada Inc.

Lime

Beachville Lime Limited
Chemical Lime Company of Canada Inc.
Continental Lime Ltd.
Dundas Lime Limited
Graybec Calcium Inc.
Havelock Lime (Division of Goldcorp. Inc.)
Ingersoll Lime Limited
Northern Lime Limited

Mining

Aur Resources Inc.
Barrick Gold Corporation – La Mine Doyon
Battle Mountain Canada Ltd., Golden Giant Mine
BHP Diamonds Inc.
Boliden Limited
Brunswick Mining Division
  (Brunswick Mining and Smelting Corporation Limited)
Brunswick Smelting and Fertilizer Division
  (Brunswick Mining and Smelting Corporation Limited)
Cominco Ltd.
Echo Bay Mines Ltd. – Lupin Operation
Falconbridge Limited
Fonderie Horne – Métallurgie Noranda inc.
Hillsborough Resources Limited
Hudson Bay Mining & Smelting Co., Ltd.
INCO Limited
International Minerals and Chemicals (Canada) Global Limited
  (IMC Kalium Canada Ltd.)
Iron Ore Company of Canada
Mines et exploration Noranda inc. – Division Matagami
Mines Wabush (gérées par la Compagnie Minière Cliffs inc.)
Noranda Metallurgy Inc. (Canadian Copper Refinery)
Placer Dome Canada Limited
Quebec Cartier Mining Company
Syncrude Canada Ltd.
Teck Corporation
Zinc Électrolytique du Canada Limitée/Canadian Electrolytic
  Zinc Limited

Petroleum Products

Amoco Canada Petroleum Company Limited
Canadian Tire Petroleum
Chevron Canada Limited – Burnaby Refinery
Enbridge Pipelines Inc.
Husky Oil Operations Ltd.

Imperial Oil Limited
Interprovincial Pipe Line Inc.
Irving Oil Limited
Nova Corporation
Parkland Refining Ltd.
Petro-Canada
Safety-Kleen
Shell Canada Products Limited
Suncor Energy Inc. – Sunoco Group
Ultramar Ltd. – Saint-Romuald Refinery

Plastics

Downeast Plastics Ltd.
Husky Injection Molding Systems Ltd.

Potash

Potash Corporation of Saskatchewan Inc.
- Allan Division
- Cory Division
- Lanigan Division
- New Brunswick Division
- Patience Lake Division
- Rocanville Division

Pulp and Paper/Forestry

Abitibi-Consolidated Inc.
Avenor Inc.
Canfor Corporation
Cariboo Pulp and Paper Company Limited
Daishowa Inc.
Donohue Inc. (QUNO Inc.)
E.B. Eddy Forest Products Ltd.
Eurocan Pulp and Paper Company Limited
F.F. Soucy Inc.
Fletcher Challenge Canada Ltd.
Fort James-Marathon, Ltd.
James Maclaren Industries Inc.
Kruger Inc.
Lake Utopia Paper
MacMillan Bloedel Limited
Maritime Paper Products Limited
Nexfor Inc.
Paperboard Industries International Inc.
(Division of Cascades Inc.)
Repap Enterprises International Inc.
Riverside Forest Products Limited, Armstrong Division
Spruce Falls Inc.
St. Marys Paper Ltd.
Stora Enso Port Hawkesbury Limited
Tembec Inc.
Weldwood of Canada Limited
West Fraser Timber Co. Ltd.
Weyerhaeuser Canada Ltd.

Rubber

Gates Canada Inc.
Michelin North America (Canada) Inc.
NRI Industries Inc.

Steel

Algoma Steel Inc.
AltaSteel Ltd.
Atlas Specialty Steels – A division of Atlas Steel Inc.
CHT Steel Company
Co-Steel LASCO
Dofasco Inc.
Frost Wire Products Ltd.
Gerdau Courtice Steel Inc.
Hilton Works
Ivaco Inc. (Ivaco Rolling Mills)
Lake Erie Steel Company Ltd.
Laurel Steel (Division of Harris Steel Limited)
QIT – Fer et Titane Inc.
Slater Steels Inc. – HSB Division
Stelco Fasteners Ltd.
Stelco Inc.
Stelco-McMaster Ltée
Stelfil Ltée
Stelpipe Ltd.
Stelwire Ltd.
Sydney Steel Corporation
Welland Pipe Ltd.

Textiles

Agmont Inc.
Albarrie Canada Limited
Barrday Inc.
Beaulieu Canada Inc.
Britex Group (The)
Cambridge Towel Corporation (The)
Canada Cordage Inc.
Canada Hair Cloth Company Limited
Cavalier Textiles
Coats Bell
Coats and Clark
Collingwood Fabrics Inc.
Collins & Aikman Canada Inc.
Consoltex Inc.
Cookshire Tex
C.S. Brooks Canada Inc.
Denim Swift
Difco Performance Fabrics Inc.
Fabrene Inc.
Glendale Yarns Inc.
Interface Flooring Systems (Canada) Ltd.
J.L. de Ball Canada Inc.
LaGran Canada Inc.
Lincoln Fabrics Ltd.
Nova Scotia Textiles, Limited
Spinrite Inc.
Stedfast Inc.
St. Lawrence Corporation
Velcro Canada Inc.
VOA Colfab Inc.

Transportation Manufacturing

Accuride Canada Inc.
AlliedSignal Aerospace Canada Inc.
Boeing Toronto Limited
Bombardier Inc.
Cami Automotive Inc.
Canadian General-Tower Limited
DaimlerChrysler Corporation
Ford Motor Company of Canada, Limited
Freightliner of Canada Ltd.
General Motors of Canada Limited
Magna Corporation – Cosma Body & Chassis Systems
Navistar International Corporation Canada
Oetiker Limited
Orenda Aerospace Corporation
Orion Bus Industries
Oxford Automotive Inc. – Suspensions Division, Chatham
Polywheels Manufacturing Limited
Pratt & Whitney Canada Inc.
Presstran Industries
Prévost Car Inc.
Rockwell Automation Canada Inc.
Russel Metals Inc.
Toyota Motor Manufacturing Canada Inc.
Varity Kelsey Hayes Canada Ltd.
Volvo Cars of Canada Ltd.
Woodbridge Group (The)

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ASSOCIATION MEMBERS

The Aero Space Industries Association of Canada

The Alliance of Manufacturers and Exporters Canada (AEC)
- The AEC Ontario Division
- The AEC Alberta Division
- The AEC Newfoundland Division
- The AEC Nova Scotia Division
- The AEC New Brunswick Division
- The AEC Manitoba Division
- The AEC British Columbia Division
- The AEC Prince Edward Island Division

The Aluminum Industry Association

The Automotive Parts Manufacturers' Association

The Canadian Association of Man Made Vitreous Fibre Manufacturers

The Canadian Cement Council (The Canadian Portland Cement Association)

The Canadian Chemical Producers' Association

The Canadian Fertilizer Institute

The Canadian Foundry Association

The Canadian Gas Association

The Canadian Lime Institute

The Canadian Meat Council

The Canadian Pulp and Paper Association

The Canadian Petroleum Products Institute

The Canadian Plastics Industries Association

The Canadian Steel Environmental Association (Canadian Steel Producers Association)

The Canadian Textiles Institute

The Canadian Vehicle Manufacturers' Association

The Council of Forest Industries

The Food and Consumer Products Manufacturers of Canada

The Mining Association of Canada

The National Dairy Council

The Ontario Food Producers' Association

The Rubber Association of Canada

Annual Census of Mines

NRCan survey that collects information on SIC 06 and SIC 08.

Annual Survey of Manufacturers (ASM)

Statistics Canada survey. Provides information on the consumption of purchased fuels and electricity for approximately 230 subsectors at four-digit SIC code levels.

Base Year

A reference year. For the Framework Convention on Climate Change, 1990 is the base year.

Climate Change Voluntary Challenge and Registry (VCR) Inc.

The VCR Inc., is a key element of Canada's National Action Program on Climate Change. It encourages the private and public sectors to take voluntary steps to limit or reduce GHG emissions. As a first step, participants are encouraged to submit a letter of intent confirming a commitment to limit or reduce GHGs from their operations. This is followed by an action plan and subsequent progress reports. The Industrial Energy Innovators Initiative provides a means for manufacturing and mining companies to enroll in the VCR Inc.

CO_2

A compound of carbon and oxygen that in its normal gaseous state is clear and colourless. CO_2 is formed whenever carbon-bearing fuels are burned. It can also be formed via other reactions not involving combustion.

Economic Energy Intensity

Energy consumption per unit of economic output.

Embodied Energy

The energy consumed to transform all upstream raw materials into the final product; in a life cycle approach, it would be the "cradle-to-grave" energy burden.

Energy Intensity

Energy consumption per unit of output.

Energy Intensity Indicator

A dimensionless ratio equal to the energy intensity in a particular year divided by the energy intensity of the base year. The energy intensity indicator for the base year equals 1.0.

Energy Performance Measures

Any of a variety of metrics that would indicate an aspect of energy performance.

Framework Convention on Climate Change (FCCC)

United Nations convention to address climate change signed by more than 150 countries at the United Nations Conference on Environment and Development in Rio de Janeiro in June 1992. Canada became the eighth country to ratify the Convention, which entered into force on March 21, 1994, thereby committing to work toward stabilizing GHG emissions at 1990 levels by the year 2000.

Greenhouse Gas (GHG)

A GHG absorbs and radiates heat in the lower atmosphere that otherwise would be lost in space. The greenhouse effect is essential for life on this planet since it keeps average global temperatures high enough to support plant and animal growth. The main GHGs are carbon dioxide (CO_2), methane (CH_4), chlorofluorocarbons (CFCs) and nitrous oxides (N_2O). By far the most abundant greenhouse gas is CO_2, accounting for 70 percent of the greenhouse effect.

Gross Domestic Product (GDP)

The total value of goods and services produced by the nation's economy before deduction of depreciation charges and other allowances for capital consumption, labour and property located in Canada. It includes the total output of goods and services by private consumers and government, gross private domestic capital investment and net foreign trade. GDP figures are reported in real 1986 dollars.

Higher Heating Value

The amount of heat that is obtained when a specified amount of fuel is combusted with its stoichiometrically correct amount of air, both being at 15°C when combustion starts, and the products of combustion being cooled to 15°C before the heat release is measured (also called gross calorific value or gross heating value).

Industrial Consumption of Energy Survey (ICE)

Statistics Canada survey on energy use. Covers purchased and nonpurchased energy for approximately 24 industrial subsectors.

Lower Heating Value

The higher heating value minus the latent heat of vaporization of the water vapour formed by the combustion of any hydrogen present in the fuel. For a fuel with no hydrogen, the higher and lower heating values are the same (also called the lower calorific value or the net heating value).

Natural Resources Canada (NRCan)

The predominant natural resource department of the federal government, NRCan has a mandate to promote the sustainable development and responsible use of Canada's mineral, energy and forestry resources and to develop an understanding of Canada's land mass.

Physical Energy Intensity

Energy consumption per unit of physical output.

Quarterly Report on Energy Supply and Demand (QRESD)

Provides an energy balance of all energy consumption in Canada. QRESD data on the manufacturing industries are mainly gathered by the Industrial Consumption of Energy (ICE) survey. These data are supplemented by other surveys on the disposition of energy (from utilities) and the production of petroleum products.

Specific Energy (Consumption)

Energy consumption per physical unit of output (also called physical energy intensity).

Standard Industrial Classification (SIC)

Statistics Canada uses a classification system that categorizes establishments into groups with similar economic activities.

Statistics Canada

Statistics Canada is the country's national statistical agency, with programs organized into three broad subject areas: demographic and social, socio-economic and economic. Under the *Statistics Act*, Statistics Canada is required to collect, compile, analyse, abstract and publish statistical information on virtually every aspect of the nation's society and economy. All information given to Statistics Canada through surveys, the census or any other source is confidential. Statistics Canada does not release any information that identifies an individual or organization.

Tier I

Informal designation by CIPEC of industries that are major energy-consuming industries. The seven designated Tier I industries are Pulp and Paper, Petroleum Refining, Cement, Mining, Steel, Chemicals and Aluminum. The Tier I industries account for approximately 80 percent of total Canadian industrial energy consumption.

Tier II

Informal designation by CIPEC of industries that are minor energy-consuming industries (relative to Tier I industries) but contribute substantially to Canadian industrial GDP. Tier II industries account for 60 percent of Canadian industrial GDP.